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STATIC TEST OF THE DAYTON WRIGHT TA-3 AIRPLANE

(AIRPLANE SECTION, S. & A. BRANCH)

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McCook Field, Dayton, Ohio
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CERTIFICATE: By direction of the Secretary of War the matter contained herein is published as administrative information and is required for the proper transaction of the public business.

STATIC TEST OF THE DAYTON WRIGHT TA-3 AIRPLANE.

SUMMARY OF RESULTS.

Airplane: Dayton-Wright TA-3.
Type: XIV.
Total weight: 1,738 pounds.
Wing cellule weight: 335 pounds.
Wing area, 229 square feet.

Engine: LeRhone, 89 horsepower.
Description: The Dayton-Wright TA-3 is a two-place, side by side, training biplane. The wing spars and ribs are wood. The fuselage and tail surfaces are of steel tube construction.

RESULTS OF TEST.

Date.	Part tested.	Load required.	Pounds per square foot or factor supported.	Failed at.	Weight.	Failure.
Jan. 27, 1922	Horizontal stabilizer.	35 pounds per sq. ft.	40 pounds per sq. ft.	None	0.98 pounds per sq. ft.	None.
Do	Elevator	do	do	do	do	Do.
Do	Elevator control	do	do	do		Do.
Jan. 28, 1922	Vertical fin	30 pounds per sq. ft.	60 pounds per sq. ft.	do	1.21 pounds per sq. ft.	Do.
Do	Rudder	do	do	do	0.98 pounds per sq. ft.	Do.
Do	Rudder control	do	do	do		Do.
Jan. 30, 1922	Ailerons	35 pounds per sq. ft.	20 pounds per sq. ft.	do	1.04 pounds per sq. ft.	Do.
Do	Aileron control	do	do	20 pounds per sq. ft.		Link connecting twin control sticks buckled.
	WING CELLULE.					
Feb. 8, 1922	High incidence	8	7.5	8	1.46 pounds per sq. ft.	The lower right rear wing spar attachment fitting pulled out.
Feb. 2, 1922	Low incidence	5.5	5.5	None	do	None.
Jan. 31, 1922	Reverse load	3.5	3.5	do	do	Do.
Mar. 18, 1922	Six-foot length of leading edge.	14	9	9		The leading edge sheared off at the face of the spar.
Mar. 7, 1922	Fuselage	7	9.5	10	142.5 pounds	The lower right longeron buckled.
Mar. 31, 1922	Tail skid	36-inch drop.	18-inch drop.	18-inch drop.	7 pounds	The fuselage supporting the tail skid failed.
Mar. 30, 1922	Chassis:					
	Struts	7.5	6	6		The left rear strut buckled.
	Axle	7	6	None	60 pounds	
	Shock absorber.	6.5	6	do		

OBJECT.

This static test was conducted for the purpose of determining the structural strength of the Dayton-Wright TA-3 airplane submitted in accordance with Contract No. 407. This airplane bears the A. S. No. 64390.

DATE AND PLACE.

The following tests were performed at McCook Field, Dayton, Ohio:

No.	Date.	Tests.
1.	Jan. 27, 1922	Elevator and stabilizer.
2.	Jan. 28, 1922	Rudder and fin.
3.	Jan. 30, 1922	Ailerons.
4.	Jan. 31, 1922	Wing cellule (reverse flight).
5.	Feb. 2, 1922	Wing cellule (low incidence).
6.	Feb. 8, 1922	Wing cellule (high incidence).
7.	Mar. 7, 1922	Fuselage.
8.	Mar. 30, 1922	Landing chassis.
9.	Mar. 18, 1922	Leading edge.
10.	Mar. 31, 1922	Tail skid.

WITNESSES.

Lieut. C. N. Monteith. K. M. Lane.
Lieut. E. W. Dichman. W. E. Savage.
Lieut. C. W. Pyle. E. R. Weaver.

SUMMARY.

WING CELLULE.

The load schedule is based on a total weight of 1,738 pounds and a wing weight of 316 pounds.

Reverse loading.—Load factor required=3.5. Center of gravity of load at 25 per cent of the chord. Angle of inclination of the mean chord=14 degrees, trailing edge down. The load was carried to a factor of 3.5 without failure.

Low-incidence loading.—Load factor required=5.5. Center of gravity of load at 48 per cent of the chord. Angle of inclination of mean chord=4° 36′, trailing edge down. The load was carried to a factor of 5.5 without failure.

High-incidence loading.—Load factor required=8.0. Center of gravity of load at 28 per cent of the chord. Angle of inclination of mean chord=10°, leading edge down. The upper right front spar at the outer strut point failed at a load factor of 6. The right upper and lower outer panels were interchanged and reinforced at the outer strut. The center section front spar fittings and fitting attaching lower rear spars to fuselage failed at a load factor of 8.

Test of leading edge of wing.—Load factor required=14. Leading edge failed at a load factor of 9.

Ailerons.—Load required=35 pounds per square foot. The compression member connecting the control sticks failed at 20 pounds per square foot.

ELEVATOR AND STABILIZER.

Load required=35 pounds per square foot.
Elevators failed at 40 pounds per square foot.

RUDDER AND FIN.

Load required=30 pounds per square foot.
Rudder failed at 60 pounds per square foot.

FUSELAGE (IN BENDING).

Load factor required = 7.

Load on the engine mount was carried to a load factor of 8 without failure. The rear portion of the fuselage failed at a load factor of 10.

IMPACT TEST OF TAIL SKID AND FUSELAGE.

Required load: Drop of 36 inches with normal load in tail-low position. Fuselage failed at 18 inches and normal load.

CHASSIS.

Load factor required=7.5.
Struts failed at a load factor of 6.

GENERAL RECOMMENDATIONS.

WINGS.

Redesign the front spar, center section front spar fittings, fittings attaching lower rear spars to the fuselage, compression members in the drag truss of the upper wing at the outer interplane strut, and leading edge structure of the wing.

Ailerons—Redesign the compression member connecting the control sticks.

ELEVATORS AND STABILIZER.

None.

RUDDER AND FIN.

None.

FUSELAGE (IN BENDING).

None.

FUSELAGE (IMPACT TEST OF TAIL SKID AND FUSELAGE).

Redesign the fuselage where tail skid is mounted.

CHASSIS.

Redesign.

GENERAL DESCRIPTION.

The Dayton-Wright TA-3 airplane is a two-place side by side training biplane. The wing spars and ribs are of wood construction with metal interplane struts. The fuselage and tail surfaces are of steel tube construction welded at the joints. All surfaces are fabric covered. The landing gear is constructed of steel tubing. The motor is a Le Rhone which delivers 89 horsepower at 1,250 revolutions per minute.

The desired performance is as follows:

(*a*) 90 miles per hour at sea level.
(*b*) Climb to 10,000 feet in 15 minutes.
(*c*) Service ceiling—14,000 feet.
(*d*) Landing speed not in excess of 45 miles per hour.

Total weight	1,738 pounds.
Wing area	229 square feet.
Weight per sq. ft	7.6 pounds.
Weight per horsepower	19.5 pounds.
Aerofoil used	U. S. A-27.
Useful load	603 pounds.

The list of equipment is in accordance with the specifications for this type of airplane.

Figure 1 is a plan view of the TA-3 airplane.

Figure 2 is a front and side elevation of the TA-3 airplane.

WING CELLULE.

DESCRIPTION.

The wing cellule is a single bay biplane with interchangeable upper and lower wings, and an unusually large center section. The center section is supported forward by two tripods of steel streamline struts and aft by two struts on the right and one on the left. There are adjustable interplane N-struts which slope upward and outward and there is but one lift wire to each spar. These wires are crossed. The one landing wire is in the forward truss.

Below are given the general wing characteristics:

Section	U. S. A.-27.
Chord	54 inches.
Mean gap	58½ inches.
Stagger	18 inches.
Incidence upper	2°.
Incidence lower	2°.
Dihedral upper	2.75°.
Dihedral lower	2.75°.
Span upper	30 feet 11$\frac{11}{16}$ inches.
Span lower	25 feet 10$\frac{7}{16}$ inches.
Weight of wings	335 pounds.
Weight per sq. ft	1.46 pounds.

The wings are of the usual wood construction with spruce "I" section spars and spruce leading and trailing edges. The main ribs are of the built-up semitruss type with basswood web and truss members and split spruce cap strips. There are three compression ribs in the two-bay drag truss. These are of the box type, having two upper and two lower spruce flanges and Spanish cedar plywood sides. The ribs are laterally braced by fabric tape which is crossed between each rib. Details of the wing may be seen in figure 3. The center section is of the same type of construction. Its contour is broken by a large "triplex" glass window in the center with the two main gas tanks on either side. Details of the center section may be seen in figure 4.

PROCEDURE FOR TEST (REVERSED FLIGHT).

The wings were assembled on the airplane as for flight and loaded according to the loading schedule in figure 5. The angle of inclination of the wing chord to the horizontal was 14° leading edge down, and the center of gravity of the load was located at 25 per cent of the wing chord, as specified in the "Handbook for Designers."

RESULTS.

The wings supported a load factor of 3.5 without signs of failure. The longest of the forward center section sup-

porting struts showed lateral deflections of ⅛ inch and $\frac{3}{16}$ inch, respectively. Figure 6 is a table of deflections and Figure 7 shows the deflection curves.

DISCUSSION.

The wings were required to support a load factor of 3.5.

CONCLUSION.

The wings supported the required load in a satisfactory manner.

PROCEDURE FOR TEST (LOW INCIDENCE).

The wings were assembled as for flight and the airplane inverted with the angle of inclination of the wing chord to the horizontal (angle γ) equals 4° 36′ with the trailing edge down. The wings were then loaded according to the loading schedule in Figure 8 with the center of gravity of the load located at 48 per cent of the chord from the leading edge corresponding to the position of the center of pressure at low incidence. Angle γ was determined as follows:

Angle of incidence $\alpha = 0° 12'$.

$$\beta = \cot^{-1} L/D = \cot^{-1} 11.9.$$
$$\beta = 4° 48'.$$
$$\gamma = \beta - \alpha = 4° 36'.$$

RESULTS.

The wings supported a load factor of 5.5 without signs of failure. Figure 9 is a table of deflections and Figure 10 shows the deflection curves.

DISCUSSION.

The wings were required to support a load factor of 5.5.

CONCLUSION.

The wings supported the required load in a satisfactory manner.

PROCEDURE FOR TEST (HIGH INCIDENCE).

The wings were assembled as for flight and the airplane inverted, the angle of inclination of the wing chord to the horizontal (angle γ) equals 10° leading edge down. The wings were then loaded according to the loading schedule in Figure 11, with the center of gravity of the load located at 28 per cent of the chord from the leading edge, corresponding to the position of the center of pressure at high incidence. Angle γ was determined as follows:

Angle of incidence $\alpha = 17°$.

$$\beta = \cot^{-1} L/D = \cot^{-1} 8.2$$
$$\beta = 7°.$$
$$\gamma = \beta - \alpha = -10°.$$

RESULTS.

The wings failed at a load factor of 6 in the following manner: The forward spar of the right upper wing split longitudinally through the routing. The split was about five feet long and appeared to have originated at the point of the interplane strut attachment. The lower half of the spar, at this point, was rotated axially and clockwise, as seen from the pilot's seat, crushing the light plywood sides of the compression rib. Figure 30 is a photograph of the failure. Figure 12 is a table of spar deflections and Figure 13 shows the deflection curves.

DISCUSSION.

The wings were required to support a load factor of 8. The failure seems to have been caused by the combined effects of longitudinal shear and a couple due to the eccentric forces of the interplane strut and the drag and lift wires. Figure 14 shows the conditions at the point of failure.

Because of this local failure no conclusions could be drawn as to the strength of the wings as a whole, so it was necessary to strengthen the parts in the locality of the failure and conduct a new test.

PROCEDURE FOR TEST.

The procedure was the same as in the first test. The loading schedule may be seen in Figure 15. The repairs and additions to the wings were as follows: The front spars were stiffened by ½-inch by 1½-inch oak blocks. Four of these were screwed to the sides of the spar on either side of the interplane strut attachment fitting front and rear. The routing was filled with spruce blocks where necessary. The compression ribs were reinforced by a $\frac{5}{16}$-inch by 3½-inch white pine member placed against the outboard side of the compression rib. The right upper and lower wings were interchanged. Figure 31 shows the repairs.

RESULTS.

The wings failed at a load factor of 8. The lower right rear wing spar attachment fitting at the fuselage pulled out while the jacks were being let down. Figure 32 is a photograph of the failure. Figure 16 is a table of spar deflections and Figure 17 shows the deflection curves. After the test the forward center section support fittings were found to have been torn. Figure 33 and 34 show this failure.

DISCUSSION.

The wings were required to support a load factor of 8. The above fitting pulled out before the wings fully supported this load.

CONCLUSIONS.

The wings did not support the required load in a satisfactory manner.

RECOMMENDATIONS.

It is recommended that the lower rear spar attachment and that the upper wings in the region of the interplane strut attachment be redesigned.

ELEVATOR AND STABILIZER.

DESCRIPTION.

The elevator and stabilizer are constructed of seamless steel tubing, welded at the joints. The stabilizer is braced with wires at the front and rear spars. False ribs of spruce extend from the leading edge to the forward spar of the stabilizer. The elevators are interchangeable with the rudder. The control horns are made of 0.065-inch flat steel plate with spruce stiffeners. Details of the elevator and stabilizer may be seen in Figure 18. The elevators are not balanced.

TABLE OF WEIGHTS AND AREAS.

	Weight.	Area.	Weight per square foot.
	Pounds.	*Square feet.*	*Pounds.*
Elevators	10	10.2	0.98
Stabilizer	13½	14.7	
Wires	1¼		.98

The controls are of the usual stick type with cables running from the horns of each elevator through the fuselage to horns on the torque tube to which the two control sticks are attached. The stabilizer is mounted solidly on the fuselage and has no adjustment.

PROCEDURE FOR TEST.

The stabilizer and elevator were mounted on the fuselage as for flight, and a spring balance was attached to the control stick to register the pull on the stick. The surfaces were then loaded according to the loading schedule in Figure 19. The load distribution over the elevators was such as to place the center of gravity of the load at $\frac{5}{12}$ the chord from the hinge center line.

RESULTS.

Figure 19 shows the deflections and results of the test. The horizontal tail surface stood the test without failure. They were loaded up to 40 pounds per square foot, after which a permanent warp in the trailing edge was noted. Figure 35 is a photograph of the warped trailing edge.

DISCUSSION.

The required loading per square foot for the stabilizer and elevator is 35 pounds. As the surfaces stood a load of 40 pounds per square foot without failure of either the surfaces or control system, it is evident that they are strong enough structurally.

CONCLUSION.

The elevator, stabilizer, and control system have sufficient strength.

RUDDER AND FIN.

DESCRIPTION.

The rudder and fin are of the same type of construction as the elevator and stabilizer. They are made of steel tube, welded at the joints. The fin is braced with wires at the front and rear spars, and has false nose ribs of spruce. The rudder is interchangeable with the elevators and is not balanced. Details of the rudder and fin may be seen in Figure 20.

TABLE OF WEIGHTS AND AREAS.

	Weight.	Area.	Weight per square foot.
	Pounds.	*Square feet.*	*Pounds.*
Rudder	5	5.1	0.98
Fin	4	4.35	
Wires	1¼		1.21

The controls consist of two steel tube rudder bars placed side by side with a horn projecting forward from the middle of each rudder bar. The extremities of these horns are connected by a steel tubular link in order that the rudder bars may turn simultaneously. The two cables to the rudder are attached to the outboard side of each rudder bar. The connecting link is always in tension.

PROCEDURE FOR TEST.

The rudder and fin were mounted on the fuselage as for flight. The surfaces were then loaded according to the loading schedule in Figure 21. A spring balance was attached to the middle of the foot rest of the rudder bar to which the control cable under load was attached, in order to register the force on the foot bar. The center of gravity of the load on the rudder was located at $\frac{5}{12}$ of the mean chord from the hinge center line.

RESULTS.

Figure 21 shows the deflections and results of the test. The rudder and fin were loaded up to 60 pounds per square foot without a failure, after which a permanent warp in the trailing edge was noted. Figure 36 is a photograph of the warped trailing edge.

DISCUSSION.

The rudder and fin were required to support 30 pounds per square foot. They supported 60 pounds per square foot without failure in the surfaces or control system.

CONCLUSION.

The rudder and fin are too heavy.

RECOMMENDATIONS.

It is recommended that the rudder and fin be redesigned.

AILERONS.

DESCRIPTION.

The ailerons are interchangeable and of wood construction. The box spar consists of an upper and lower spruce flange connected by webs of three-ply mahogany. Filler blocks are placed in the spar at the points where the horn and hinge fittings are attached. The trailing edge is of spruce and the outboard contour member is an ash bow. All of the ribs have basswood webs and spruce cap strips. Details of the aileron may be seen in figure 22.

TABLE OF WEIGHTS AND AREAS.

	Weight.	Area.	Wt. per sq. ft.
	Pounds.	*Sq. ft.*	*Pounds.*
Aileron	7	6.75	1.04

There are ailerons on both upper and lower wings. The aileron on the the upper wing is actuated by a strut which connects it to the aileron on the lower wing. The aileron on the lower wing is actuated by a rod which runs from the single aileron horn to a triangular bell-crank lever. To the triangular bell-crank lever are attached the two control cables. One of these cables is continuous through the fuselage. The other cable passes over a pulley in a line about which the twin control sticks pivot when moved fore and aft, and crosses over to the lower extremity of the

opposite control stick, which is below the pivot line. The twin sticks are connected by a steel tubular link at their lower extremities, which causes the sticks to swing simultaneously. The interaileron strut and the aileron horn are not attached to the same rib.

PROCEDURE FOR TEST.

The wings and ailerons were mounted on the fuselage as for flight. A spring balance was attached to the right control stick, in order to register the pull on the stick, and the right upper and lower ailerons were loaded according to the loading schedule in figure 23. No deflection readings were taken. The center of gravity of the load on the aileron was located at 5/12 of the chord from the hinge center line.

RESULTS.

Figure 23 shows the results of the test. At a load of 10 pounds per square foot there was an excessive deflection in both ailerons. At a load of 20 pounds per square foot the link connecting the twin control sticks buckled. Figure 37 is a photograph of the failure of the connecting link. The triangular bell-crank lever support pulled away from the spar. Figure 38 is a photograph of this failure.

DISCUSSION.

The required loading per square foot on the aileron was 35 pounds. The ailerons showed excessive deflections under a load of 10 pounds per square foot and the control mechanism failed at a load of 20 pounds per square foot.

CONCLUSION.

Since the abnormal deflection was due largely to the design of the control system, and since the control system failed so soon, no conclusions can be made as to the structural strength of the ailerons. It is evident, however, that the control system is weak.

RECOMMENDATIONS.

It is recommended that the control mechanism be redesigned.

FUSELAGE.

DESCRIPTION.

The fuselage is of steel tube and wire construction. It is rectangular in section and has four steel tube longerons. The joints are welded with gusset plates in the corners, which serve as anchorages for the swaged bracing wires. The mounting for the rotary motor consists of a reinforced sheet-steel bulkhead, which supports the motor directly behind the cylinders, and a pyramid of four steel tubes, which support the rear end of the crank shaft, and which connect the longeron bulkhead joints to the ring which supports the crank shaft. There is a door on the right-hand side of the fuselage, which is locked in such a way that the stresses in the upper longeron are continuous through the door. The weight of the fuselage is 142.5 pounds. Details of the fuselage may be seen in figure 24. Figure 39 is a photograph of the engine mounting.

PROCEDURE FOR TEST.

The fuselage was hung in a jig in such a way that it was supported at the wing hinges. The fuselage was loaded, as shown in the loading schedule in Figure 25. The spacing of the deflection points is shown in Figure 26. The engine load was hung on a jig. Figure 39 is a photograph of this jig.

RESULTS.

The fuselage failed at a load factor of 10. The lower right longeron two bays back of the cockpit failed by buckling. Figure 26 shows the results of the fuselage test. Figure 40 is a photograph of the longeron failure.

DISCUSSION.

The fuselage was required to support a load factor of 7.

CONCLUSION.

The fuselage supported the required load in a satisfactory manner.

LEADING EDGE TEST.

DESCRIPTION.

The wings of the Dayton-Wright TA-3 have a spruce leading edge. The contour from the front spar to the leading edge is maintained by two laminated formed strips between each main rib. These are in the upper surface only. Fabric covering is used.

PROCEDURE FOR TEST.

A 6-foot section from the upper wing panel was placed in an inverted position and supported along the spars. A counterbalance was placed on the rear spar and the leading edge loaded in 10-pound increments until failure. Figure 27 is a diagrammatic drawing of the set-up and loading.

RESULTS.

At a load factor of 9 the leading edge sheared off at the face of the front spar. Figure 27 gives the result of the leading edge test.

DISCUSSION.

The leading edge was required to support a load factor of 14. It failed at 9.

CONCLUSION.

The leading edge did not support the required load in a satisfactory manner.

RECOMMENDATIONS.

It is recommended that the leading edge be strengthened.

LANDING GEAR TEST.

DESCRIPTION.

The landing gear is constructed of steel tubing. It has two wheels and the usual "V" struts on each side. There are two axles, however, which cross each other and pivot on the opposite side of the fuselage from the wheel. The shock absorber cord is wound on fore and aft spindles, which are located at the apex of the "V" struts. The weight of the landing gear structure is 60 pounds. The weight of the wheels is 55 pounds. Figure 28 is a drawing of the landing gear.

PROCEDURE.

The landing gear was set in the testing jig in such a manner that the line of reaction coincided with a line passing from the wheels through the center of gravity of the air-

plane. The center of gravity of the testing load was directly over the axle. The wheels were removed and the axles set in cradles. The load was applied, as shown in the loading schedule in Figure 29.

RESULTS.

The landing gear failed at a load factor of 6. The left rear strut buckled. As the shock absorbers deflected the axles moved laterally in the cradles 1¼ inches. The results are tabulated in Fgure 29. Figure 41 is a photograph of the failure.

DISCUSSION.

The landing gear was required to support a load factor of 7.5. The lateral movement of the axles would undoubtedly severely stress the wheels.

CONCLUSION.

The landing gear did not support the required load in a satisfactory manner.

RECOMMENDATIONS.

It is recommended that the landing gear be redesigned.

TAIL SKID TEST.

DESCRIPTION.

The tail skid is formed out of steamed hickory. It is pivoted in the middle and swivels on the last bottom cross member of the fuselage, which is reinforced by a tripod of steel tubes. The weight of the tail skid is 7 pounds.

PROCEDURE FOR TEST.

The fuselage with the tail skid attached was hung in a jig in the following manner: The front end of the fuselage was pivoted about a transverse axis which made an angle of 14° with the horizontal. A load of 287.5 pounds including, the weight of the fuselage, was placed on the rear end of the fuselage over the tail skid and securely fastened. The tail skid was then lifted off the floor and allowed to drop. The height to which it was raised was stepped up in 6-inch increments until the failure occurred.

RESULTS.

When the tail skid was dropped from a height of 18 inches the following failures occurred: The cross tubes of the fuselage to which the swivel was attached was rotated forward and upward, deforming the two vertical members of the reinforcing tripod and breaking the horizontal member. The skid itself was slightly cracked. Figure 42 is a photograph of the failure.

DISCUSSION.

It was required that the tail skid and its support should withstand a drop of 36 inches.

CONCLUSION.

The tail-skid support did not meet the requirements in a satisfactory manner.

RECOMMENDATIONS.

It is recommended that the fuselage in the vicinity of the tail skid be redesigned.

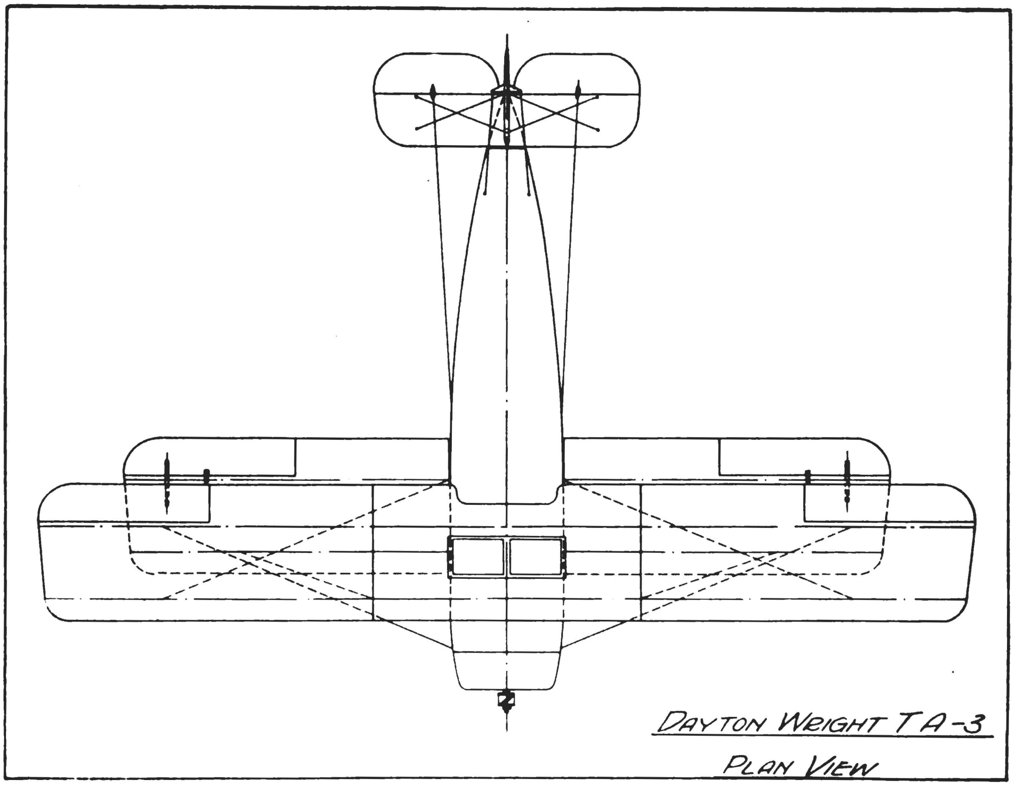

FIG. 1.

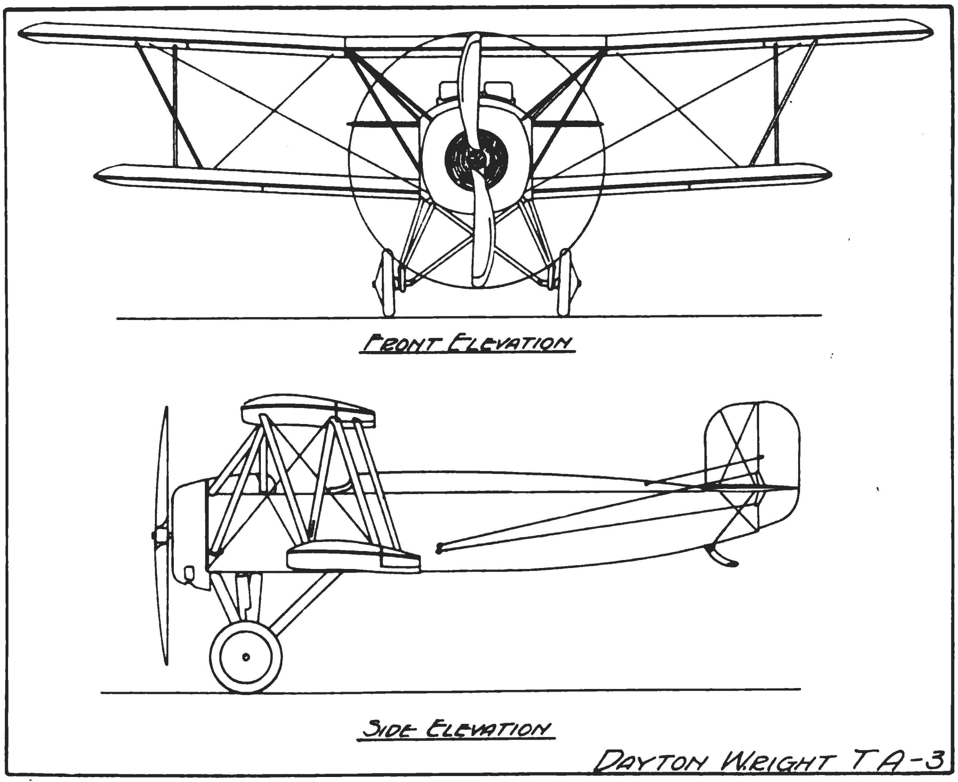

FIG. 2.

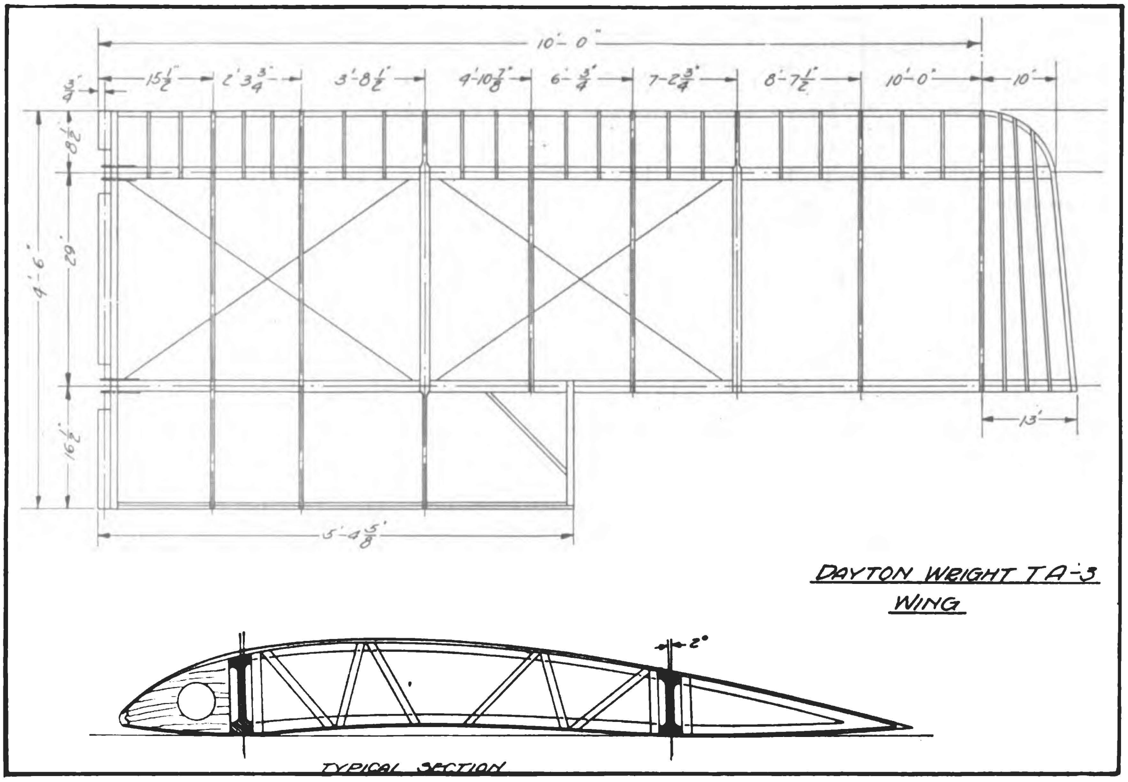

FIG. 3.

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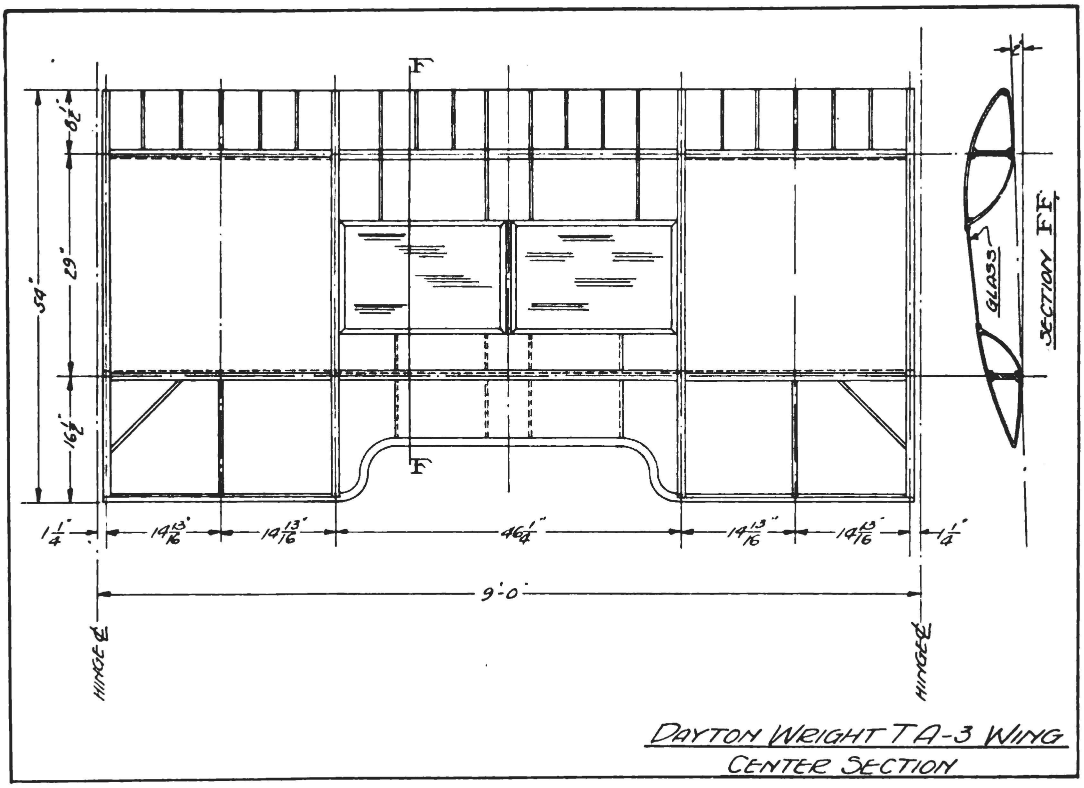
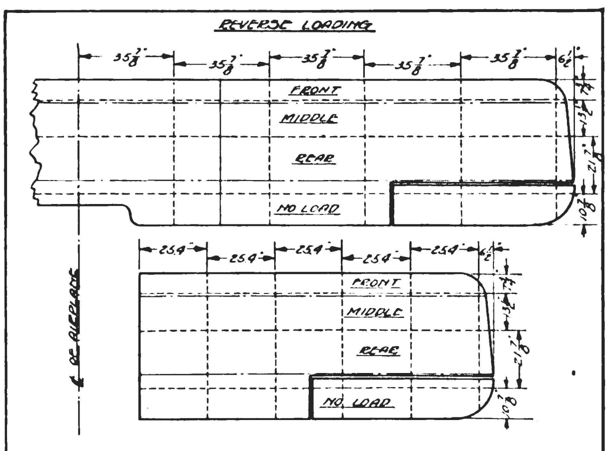


FIG. 4.



REVERSE LOADING								
LOADING SCHEDULE FOR UPPER AND LOWER WINGS								
LOAD FACTOR	UPPER WING			TOTAL LOAD	LOWER WING			TOTAL LOAD
	FRONT	MIDDLE	REAR		FRONT	MIDDLE	REAR	
2	730	370	360	1460	530	270	270	1070
2 5	940	470	460	1870	680	350	340	1370
3	1150	570	560	2280	830	430	410	1670
3 5	1360	670	660	2690	980	510	480	1970

SINCE THE SPAN OF BOTH UPPER AND LOWER WINGS ARE DIVIDED INTO TEN PARTS, THE LOAD PER SECTION MAY BE FOUND BY DIVIDING THE ABOVE VALUES BY TEN.

DAYTON WRIGHT TA-3

FIG. 5.

REVERSE LOADING

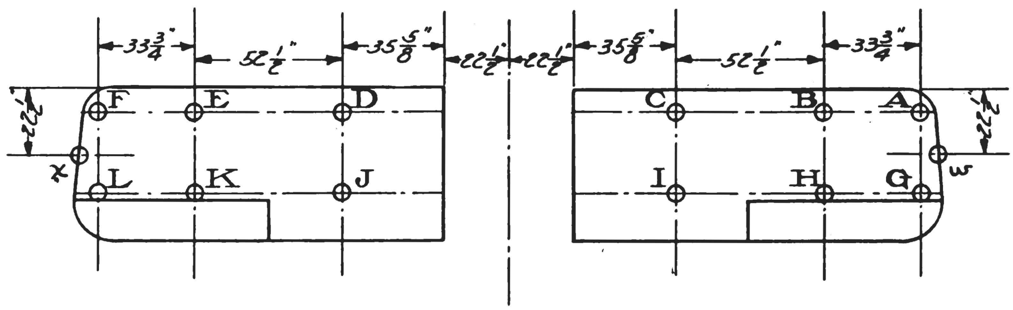
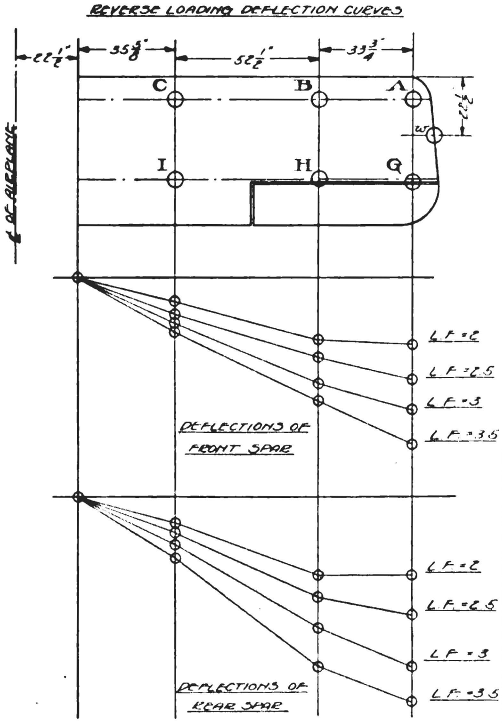


TABLE OF LOWER WING SPAR DEFLECTION IN INCHES																
LOAD FACTOR	FRONT SPAR						REAR SPAR						RETREAT			
	RIGHT			LEFT			RIGHT			LEFT			LOWER		UPPER	
	A	B	C	D	E	F	G	H	I	J	K	L	w	x	w	x
2	1.0	0.7	0.3	0.2	0.4	0.5	1.1	1.0	0.3	0.3	0.8	0.7	-.3	-.3	-.2	+.1
2.5	1.3	0.9	0.5	0.3	0.6	1.0	1.4	1.2	0.4	0.4	1.1	1.3	-.5	-.5	-.4	+.2
3	1.7	1.2	0.6	0.4	0.9	1.3	2.1	1.5	0.5	0.6	1.5	1.8	-.7	-.5	-.4	+.5.
3.5	2.0	1.4	0.7	0.5	1.2	1.8	2.2	1.9	0.7	0.7	2.0	2.5	-.9	-.6	-.6	+.6

DAYTON WRIGHT TA-3

FIG. 6.

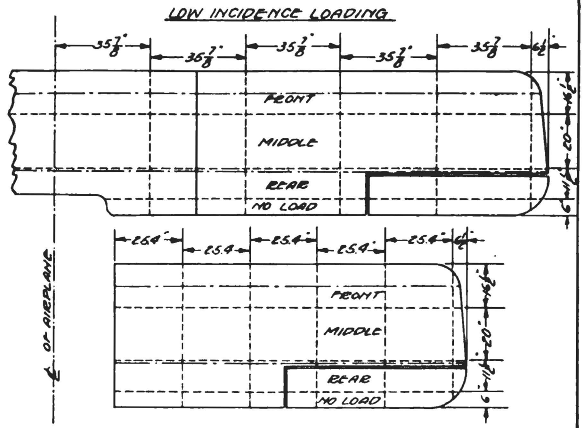
REVERSE LOADING DEFLECTION CURVES



DAYTON WRIGHT TA-3

FIG. 7.

LOW INCIDENCE LOADING



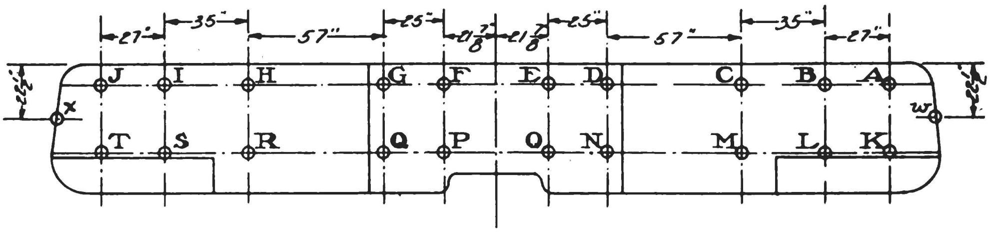
LOW INCIDENCE LOADING								
LOADING SCHEDULE FOR UPPER AND LOWER WINGS								
LOAD FACTOR	UPPER WING			TOTAL LOAD	LOWER WING			TOTAL LOAD
	FRONT	MIDDLE	REAR		FRONT	MIDDLE	REAR	
3	610	1230	610	2450	370	760	370	1500
4	830	1670	830	3330	500	1030	510	2040
4.5	940	1890	940	3770	570	1160	580	2310
5	1050	2110	1050	4210	640	1290	650	2580
5.5	1160	2330	1160	4650	710	1420	720	2850

SINCE THE SPAN OF BOTH UPPER AND LOWER WINGS ARE DIVIDED INTO TEN PARTS, THE LOAD PER SECTION MAY BE FOUND BY DIVIDING THE ABOVE VALUES BY TEN

DAYTON WRIGHT TA-3

FIG. 8.

LOW INCIDENCE



LOAD FACTOR	FRONT SPAR										REAR SPAR										RETREAT			
	RIGHT					LEFT					RIGHT					LEFT					LOWER		UPPER	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	w	x	w	x
3	1.4	1.0	0.7	0.2	0.4	0.4	0	0.7	1.0	1.7	1.4	1.2	1.0	0	0.4	0.4	0.4	1.0	1.3	1.8	-.2	-.1	+.3	+.2
4	1.9	1.4	1.0	0.2	0.5	0.5	0	1.0	1.5	2.3	2.0	1.7	1.4	0.1	0.6	0.6	0.4	1.4	1.9	2.6	-.2	-.3	+.5	+.4
4.5	2.2	1.8	1.2	0.4	0.4	0.3	0.1	1.2	1.8	2.6	2.3	2.0	1.6	0.3	0.7	0.7	0.4	1.6	2.3	3.0	-.3	-.5	+.8	+.5
5	2.5	2.0	1.4	0.2	0.5	0.5	0.1	1.6	2.2	3.2	2.7	2.3	1.8	0.2	0.8	0.8	0.5	1.9	2.6	3.4	-.3	-.8	+.7	+.6
5.5	2.8	2.3	1.5	0.4	0.6	0.6	0.2	1.7	2.6	3.6	3.1	2.6	2.2	0.3	0.9	0.9	0.5	2.2	3.0	4.0	-.3	-1.0	+.7	+.5

DAYTON WRIGHT TA-3

FIG. 9.

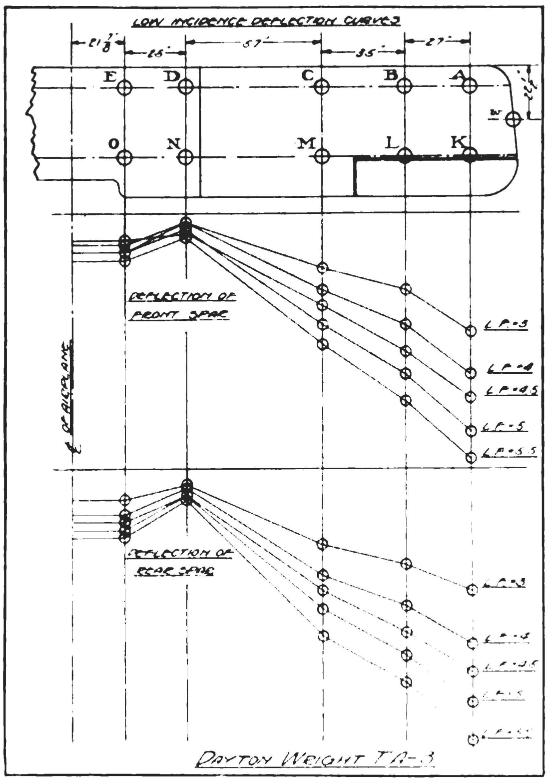
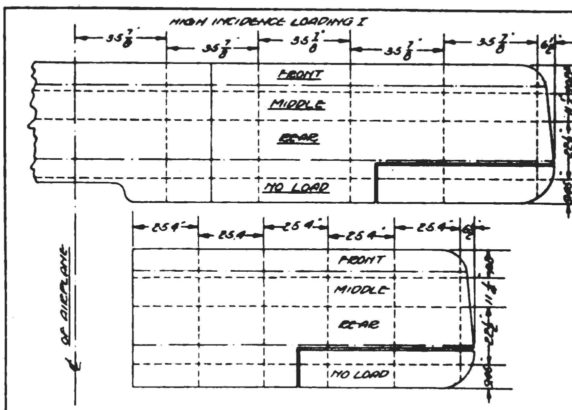


FIG. 10

HIGH INCIDENCE LOADING I



HIGH INCIDENCE LOADING I								
LOADING SCHEDULE FOR UPPER AND LOWER WING								
LOAD FACTOR	UPPER WING			TOTAL LOAD	LOWER WING			TOTAL LOAD
	FRONT	MIDDLE	REAR		FRONT	MIDDLE	REAR	
3	1220	620	610	2450	750	380	370	1500
4	1660	840	830	3330	1020	520	500	2040
5	2100	1060	1050	4210	1290	660	630	2580
5.5	2320	1170	1160	4650	1430	730	690	2850
6	FAILURE OF FRONT UPPER RIGHT SPAR AT STRUT ATTACHMENT							

TOTAL LOAD SUPPORTED BY WINGS — — — — — 7500#

SINCE THE SPAN OF BOTH UPPER AND LOWER WINGS ARE DIVIDED INTO TEN PARTS, THE LOAD PER SECTION MAY BE FOUND BY DIVIDING THE ABOVE VALUES BY TEN.

DAYTON WRIGHT TA-3

FIG. 11.

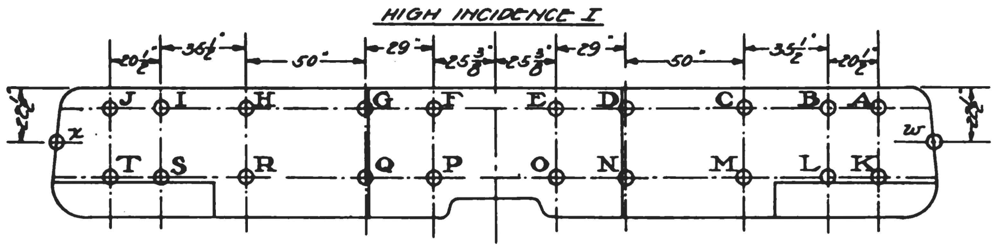


TABLE OF UPPER WING SPAR DEFLECTIONS IN INCHES																								
LOAD FACTOR	FRONT SPAR										REAR SPAR										RETREAT			
	RIGHT					LEFT					RIGHT					LEFT					LOWER		UPPER	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	W	X	W	X
4	1.9	1.6	1.2	0.5	0.8	0.7	0.6	1.2	1.4	1.8	1.8	0.6	1.0	0.2	0.3	0.4	0.2	0.8	1.2	1.8	+.2	+.1	+.5	+.7
5	2.4	1.9	1.6	0.6	0.9	1.0	0.8	1.5	1.9	2.5	2.3	1.0	1.2	0.3	0.3	0.4	0.3	1.0	1.8	2.4	+.3	+.3	+.8	+.8
5.5	2.8	2.1	1.8	0.6	1.1	1.0	0.7	1.9	2.2	2.9	2.6	1.1	1.4	0.2	0.4	0.5	0.3	1.2	1.9	2.6	+.3	+.3	+.6	+.8
6	THE FRONT RIGHT UPPER SPAR FAILED AT THE POINT OF STRUT CONNECTION BY SPLITTING																							

NOTE: THE SPAR SPLIT LONGITUDINALLY AND THE OFFSET FORCES CAUSED BY ECCENTRIC STRUT AND WIRE CONNECTIONS ROTATED THE LOWER HALF OF THE SPAR AXIALLY CLOCKWISE AS SEEN FROM THE FUSELAGE.

DAYTON WRIGHT TA-3

FIG. 12.

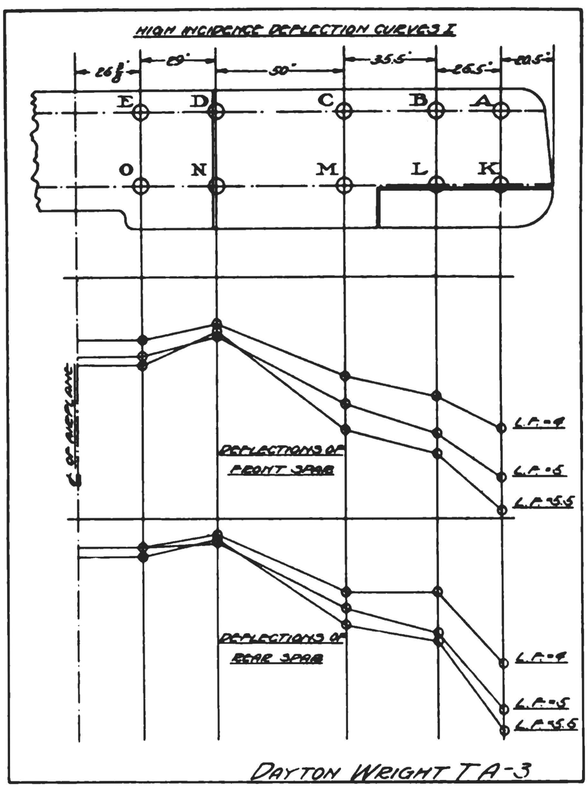


FIG. 13.

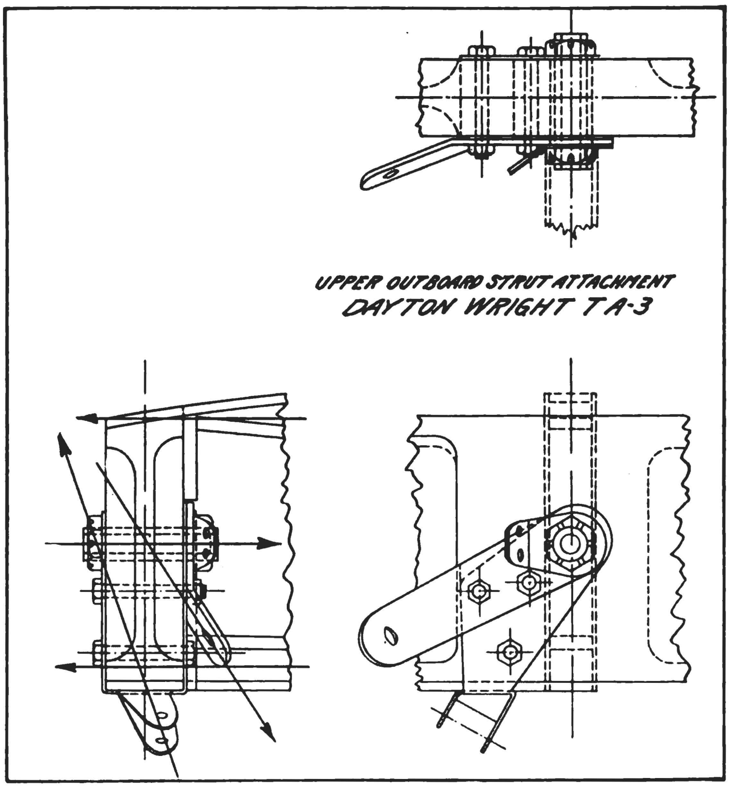
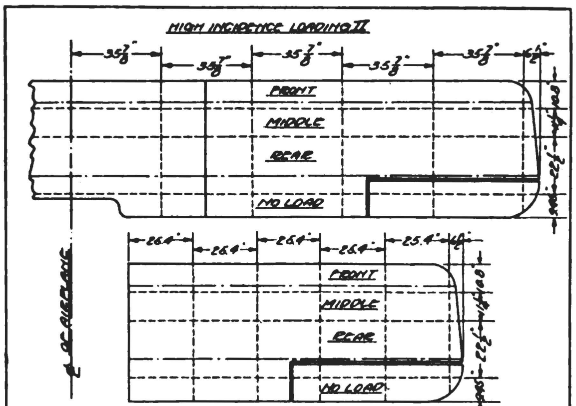


FIG. 14.



HIGH INCIDENCE LOADING II								
LOADING SCHEDULE FOR UPPER AND LOWER WINGS								
LOAD FACTOR	UPPER WING			TOTAL LOAD	LOWER WING			TOTAL LOAD
	FRONT	MIDDLE	REAR		FRONT	MIDDLE	REAR	
4	1660	840	830	3330	1020	620	500	2040
5	2100	1060	1050	4210	1290	660	630	2580
5.5	2320	1170	1160	4650	1430	730	690	2850
6	2540	1280	1270	5090	1570	800	750	3120
6.5	2760	1390	1380	5530	1710	870	810	3390
7	2980	1500	1490	5970	1850	940	870	3660
7.5	3200	1610	1600	6410	1990	1010	930	3930
8	FAILURE OF LOWER LEFT REAR WING SPAR ATTACHMENT FITTING							

TOTAL LOAD SUPPORTED BY WINGS — — — — 10,340#

SINCE THE SPAN OF BOTH UPPER AND LOWER WINGS ARE DIVIDED INTO TEN SECTIONS, THE LOAD PER SECTION MAY BE FOUND BY DIVIDING ABOVE VALUES BY TEN.

DAYTON WRIGHT T A-3

FIG. 15.

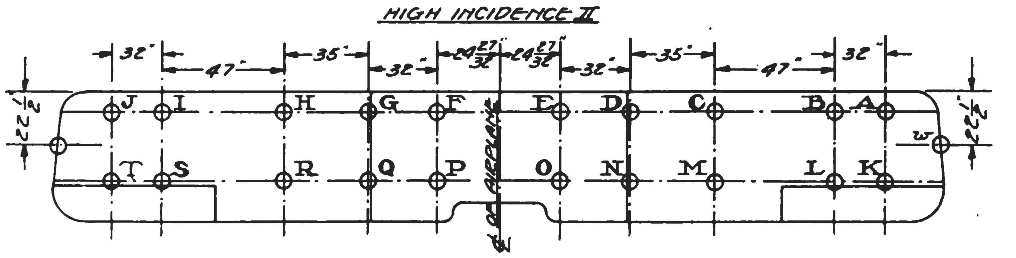


TABLE OF UPPER WING SPAR DEFLECTIONS IN INCHES																								
LOAD FACTOR	FRONT SPAR										REAR SPAR										RETREAT			
	RIGHT					LEFT					RIGHT					LEFT					LOWER		UPPER	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	w	x	w	x
4	2.5	1.0	0.6	0.3	0.6	0.7	0.4	1.2	1.7	2.1	1.4	0.9	0.5	0.1	0.2	0.6	0.2	1.1	1.6	2.2	+.2	+.5	+.4	+.1
5	2.9	1.4	0.9	0.3	0.7	0.8	0.5	1.5	2.1	2 7	1.9	1.2	0.6	0.0	0.3	0.6	0.3	1.3	2.1	2.7	.2	.6	.4	.3
5.5	3.2	1.6	1.0	0.5	0.8	0.9	0.5	1.6	2.2	3.0	2 1	1.6	0.7	0.1	0.3	0.6	0.3	1.4	2.3	2.9	.3	.6	.4	.1
6	3.6	1.9	1.2	0.4	0.9	0.9	0.5	1.7	2.6	3.4	2.4	1.7	0.9	0.1	0.4	0.7	0.3	1.6	2.5	3.2	.3	.5	.4	.2
6.5	3.8	2.2	1.4	0.5	1.0	1.1	0.4	1.9	2.9	3.9	2 8	2.0	1.1	0.1	0.4	0.6	0.3	1.7	2.8	3.6	2	.7	4	4
7	4.8	2.8	1.7	0.6	1.1	1.2	0.6	2.2	3.4	4.8	3.5	2.4	1.3	0.2	0.4	0.7	0.4	1.9	3.3	4.3	2	.5	.7	4
7.5	5.6	3.6	2.0	0.6	1.2	12	0.6	2.8	4.4	6.0	4.4	3.1	1.6	0.2	0.5	0.8	0.4	2.2	4.2	5.4	0	.5	.6	.5
8	THE LOWER LEFT REAR WING SPAR ATTACHMENT FITTING OF THE FUSELAGE TORE OUT.																							

DAYTON WRIGHT TA-3

FIG. 16.

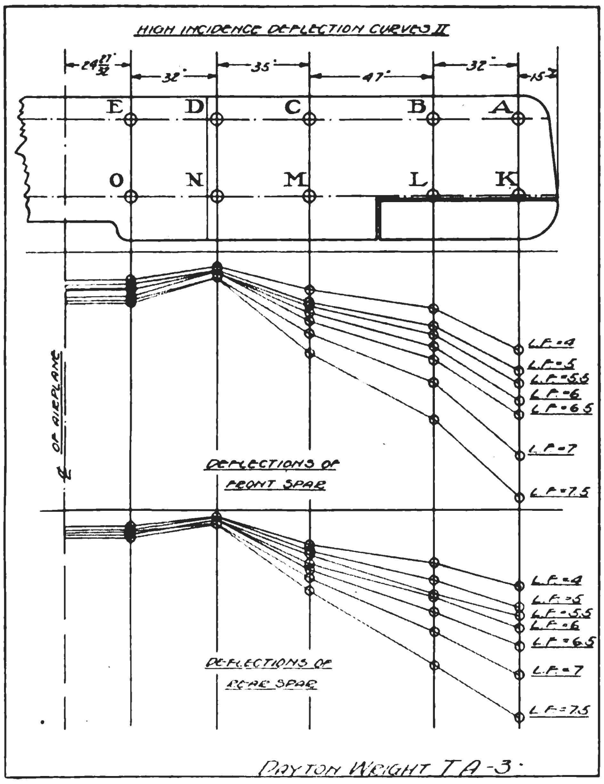


FIG. 17.

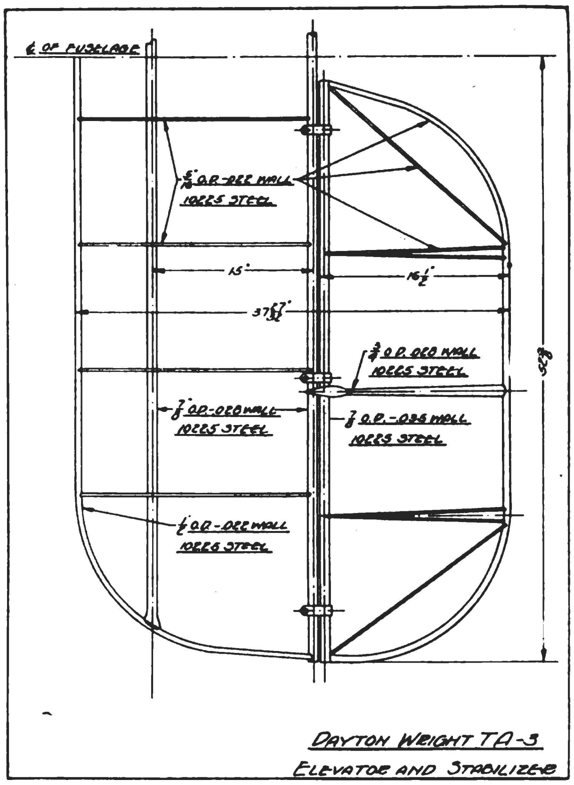
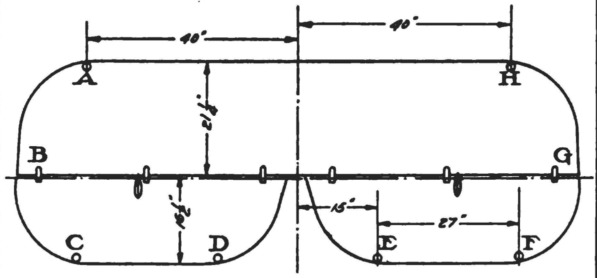


FIG. 18.



AREA OF STABILIZER ———— 14.7□'
AREA OF ELEVATOR ———— 10.2□'
TOTAL HORIZONTAL TAIL AREA —— 24.9□'

RESULTS OF STABILIZER AND ELEVATOR TEST											
LOADING			PULL ON	DEFLECTIONS							
# □'	STAB.	ELEV.	STICK	A	B	C	D	E	F	G	H
5	85	42	15	0	.1	.1	0	.1	.2	0	.1
10	170	84	25	0	.1	.4	.5	.6	.5	0	.1
15	255	126	45	0	.1	.8	1.0	1.0	1.0	0	.2
20	340	168	55	0	.1	1.3	1.4	1.5	1.3	0	.2
22.5	382	189	65	.1	.2	1.5	1.7	1.8	1.7	0	.2
25	425	210	70	.1	.2	1.7	1.9	2.2	1.8	0	.2
27.5	467	231	80	.1	.2	2.0	2.1	2.8	2.4	0	.2
30	510	252	90	.1	.3	2.3	2.5	2.4	2.9	0	.2
32.5	552	273	100	.1	.3	2.7	2.9	3.9	3.3	0	.2
35	595	294	110	.1	.3	3.3	3.7	4.5	3.9	.1	.2
37.5	637	315	NO FAILURE - PERMANENT WARP IN TRAILING EDGE.								
40	670	336	"	"		"		"	"	"	"

DAYTON WRIGHT TA-3

FIG. 19.

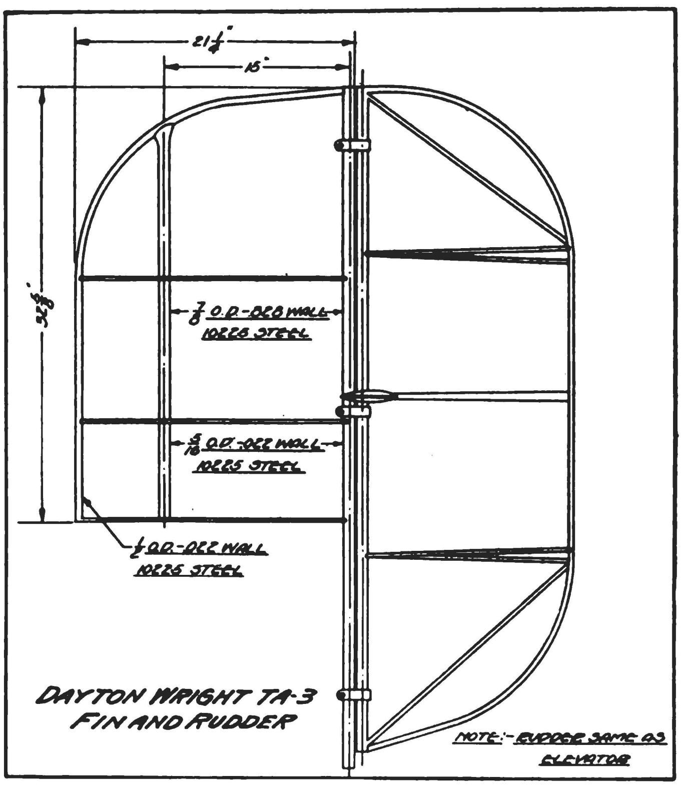
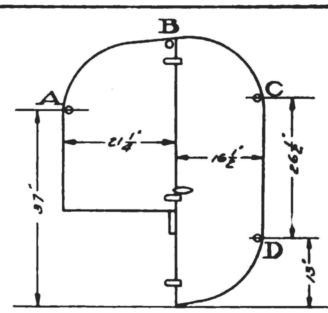


FIG. 20.



AREA OF FIN ———— 4.35□'
AREA OF RUDDER ———— 5.10□'
TOTAL VERTICAL TAIL AREA —— 9.45□'

RESULTS OF FIN AND RUDDER TEST							
LOADING			PULL ON STICK	DEFLECTIONS			
#/□'	FIN	RUDDER		A	B	C	D
5	26.5	20.75	15	.1	.1	.2	.2
10	53	40.5	30	.1	.1	.4	.4
15	79.5	62.3	40	.1	.2	.7	.7
20	106	83	55	.2	.2	1.2	1.2
22.5	119	93	65	.2	.2	1.1	1.1
25	132.5	104	75	.3	.3	1.5	1.7
27.5	146	114	90	.2	.3	1.7	2.0
30	159	125	100	.3	.3	1.9	2.1
—	LOAD CARRIED TO 60# □' IN 2.5# STEPS						
60	NO FAILURE - PERMANENT WARP IN T.E.						

DAYTON WRIGHT TA-3

FIG. 21.

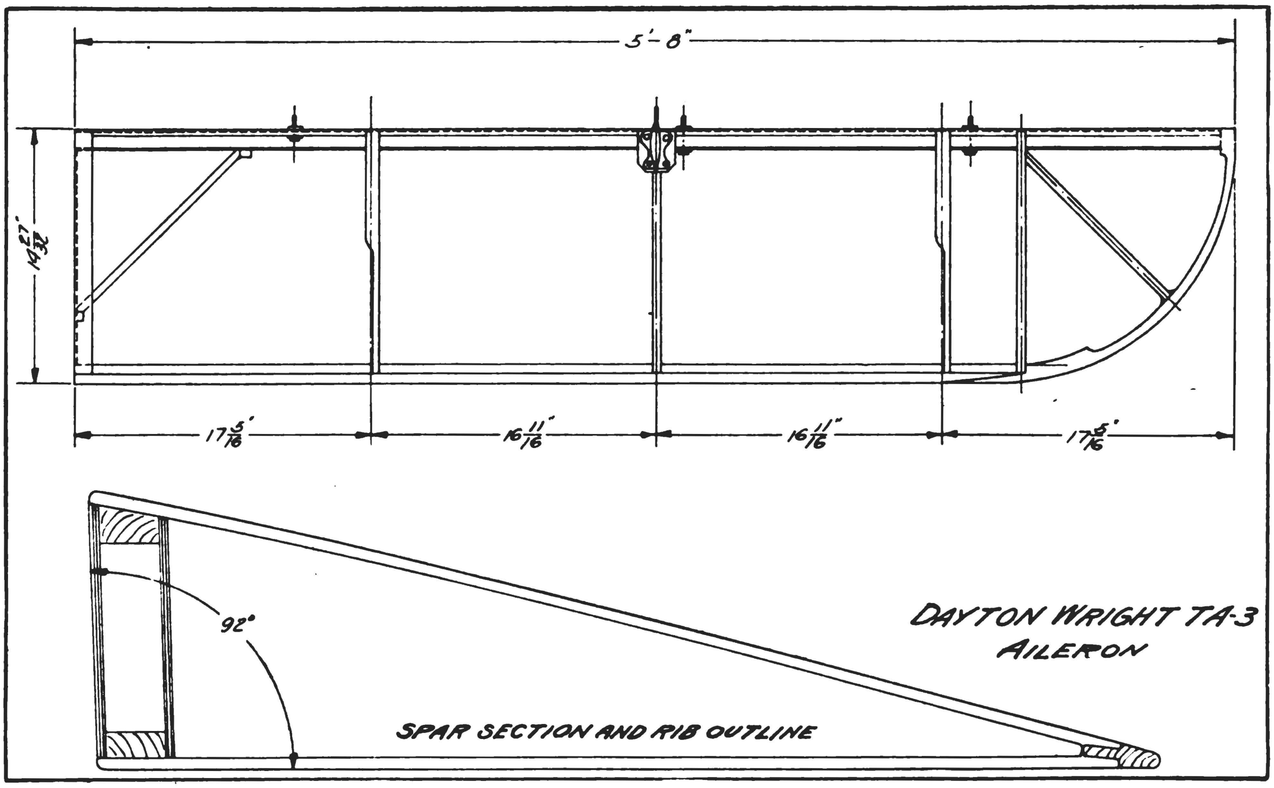
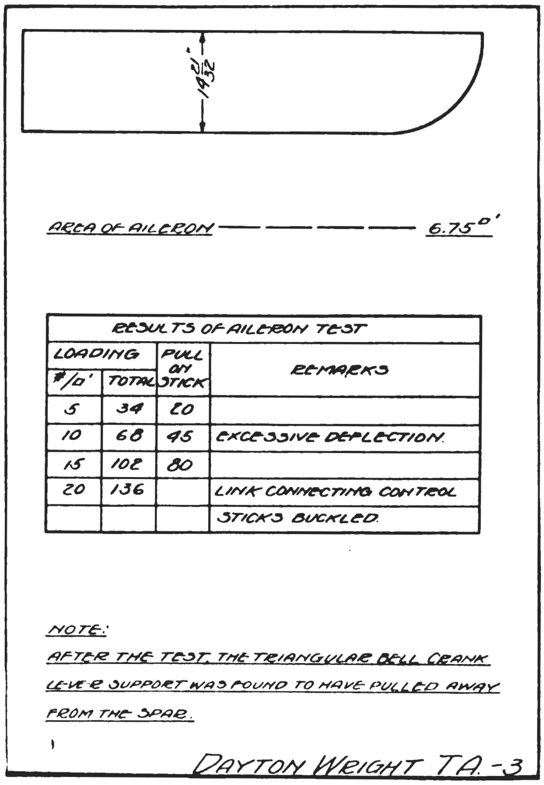


Fig. 22.



RESULTS OF AILERON TEST			
LOADING		PULL ON STICK	REMARKS
#/□'	TOTAL		
5	34	20	
10	68	45	EXCESSIVE DEFLECTION.
15	102	80	
20	136		LINK CONNECTING CONTROL
			STICKS BUCKLED.

Fig. 23.

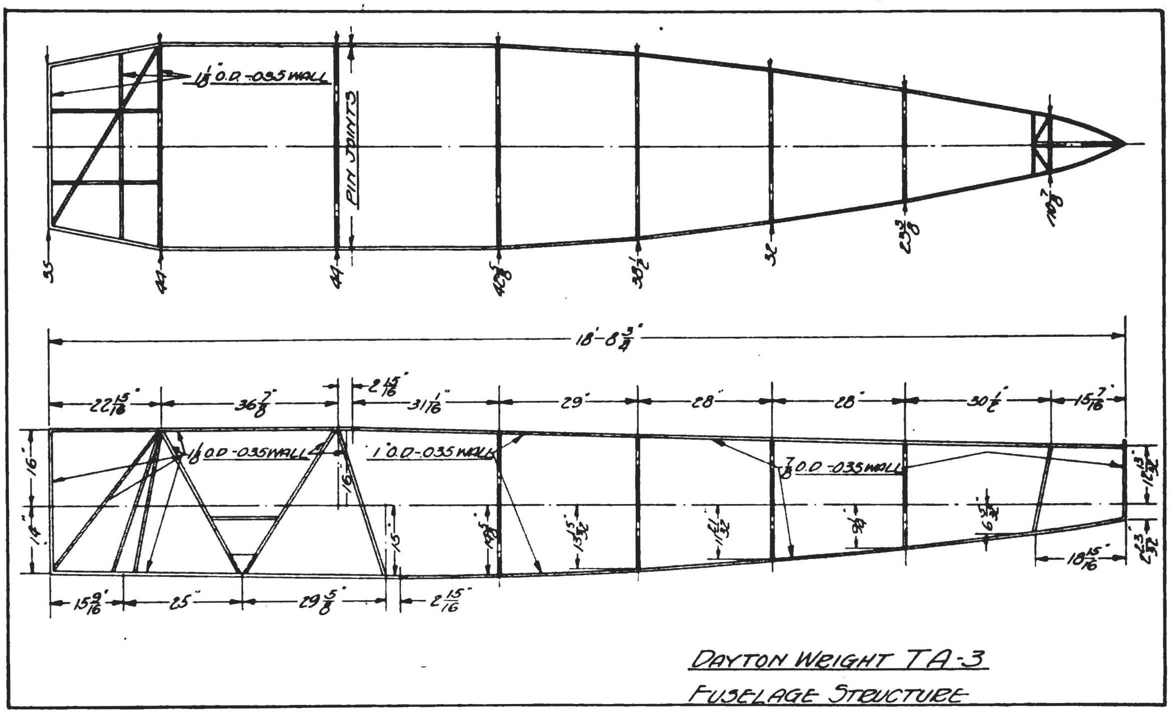
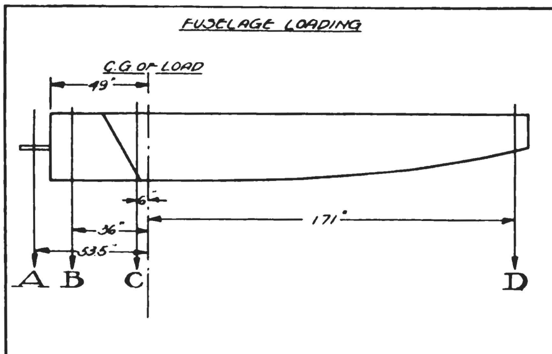


FIG. 24.



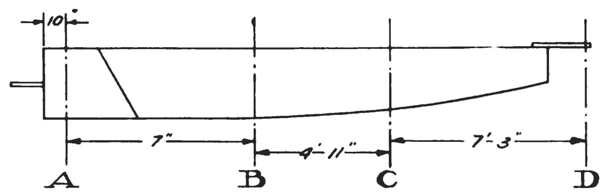
FUSELAGE LOADING SCHEDULE				
LF	A	B	C	D
2	650	300	1104	363
3	974	484	1686	565
4	1298	668	2268	767
5	1722	852	2850	969
5.5	1884	944	3141	1070
6	2046	1036	3432	1171
6.5	2208	1128	3723	1272
7	2370	1220	4014	1373
10	FAILURE OF LOWER R H LONGERON			

TOTAL LOAD SUPPORTED BY FUSELAGE — 12753#

DAYTON WRIGHT TA-3

FIG. 25.

FUSELAGE DEFLECTIONS

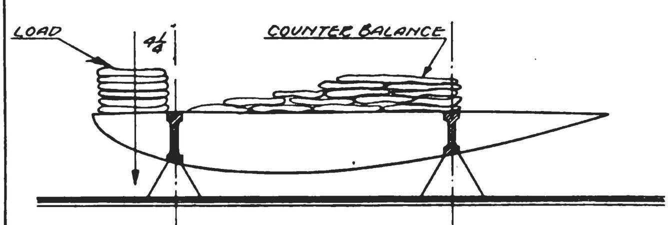


FUSELAGE DEFLECTIONS IN INCHES					
L.F.	A	B	C	D	REMARKS
2	0.3	0.5	0.8	1.5	
3	0.5	0.6	1.0	1.7	
4	0.7	0.8	1.2	2.2	
5	0.7	1.0	1.5	2.9	
5.5	0.7	1.0	1.9	3.2	
6	0.7	1.1	2.1	3.7	
6.5	0.7	1.2	2.1	3.9	
7	0.7	1.3	2.3	4.1	
10	FAILURE OF LOWER RIGHT LONGERON.				

DAYTON WRIGHT T A-3

FIG. 26.

LEADING EDGE TEST



LOADING DIAGRAM

LOAD SUPPORTED BY LEADING EDGE —— —— —— —— 950#
LEADING EDGE SHEARED OFF AT THE FACE OF THE FRONT SPAR

WEIGHT OF AIRPLANE —— —— —— —— —— —— —— 1738#
LOAD CARRIED BY UPPER WING = 1738 X .62 —— —— 1077#
LOAD ON UPPER WING PER FOOT RUN = 1077÷31 —— 35#
LOAD ON LEADING EDGE FOR FACTOR OF ONE = 35÷2 —— 18#
LOAD PER FOOT CARRIED BY THE LEADING EDGE =
950÷6 —— 158.3
FACTOR AT WHICH LEADING EDGE FAILED = 158.3 ÷ 18 —— 9

DAYTON WRIGHT T A-3

FIG. 27.

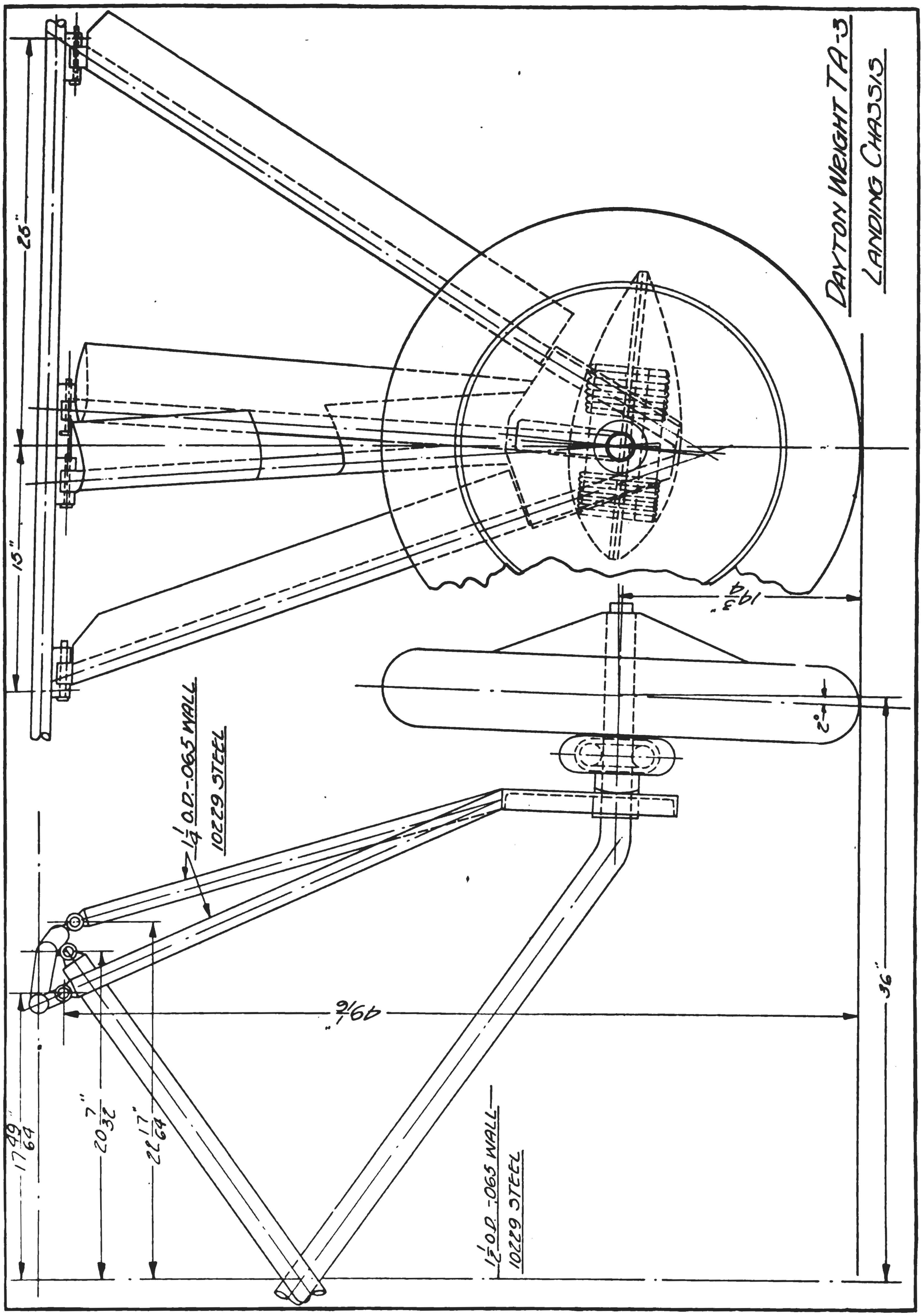
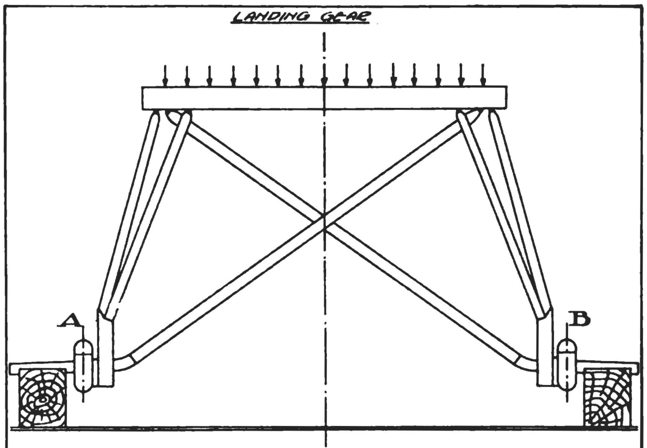

DAYTON WEIGHT TA-3
LANDING CHASSIS
$1\frac{1}{4}$ O.D.-.065 WALL
10229 STEEL
$1\frac{1}{2}$ O.D. -.065 WALL
10229 STEEL
28"
15"
$19\frac{3}{4}$"
2°
36"
$49\frac{1}{16}$"
$17\frac{49}{64}$"
$20\frac{7}{32}$"
$22\frac{17}{64}$"

FIG. 28.



RESULTS OF LANDING GEAR TEST				
LOAD FACTOR	TOTAL LOAD #	DEFLECTIONS A	DEFLECTIONS B	REMARKS
2	3476	0.19	0.69	
3	5214	0.50	1.00	BOW IN LEFT REAR STRUT AND IN AXLES
4	6952	0.94	1.19	" " " " " " " "
5	8690	1.69	2.13	" " " " " " " "
5.5	9559	—	—	PERMANENT SET IN LEFT REAR STRUT.
6	10428	—	—	LEFT REAR STRUT BUCKLED.

NOTE: THE AXLES MOVED LATERALLY IN THE BLOCKS 1¼"

DAYTON WRIGHT TA-3

Fig. 29.

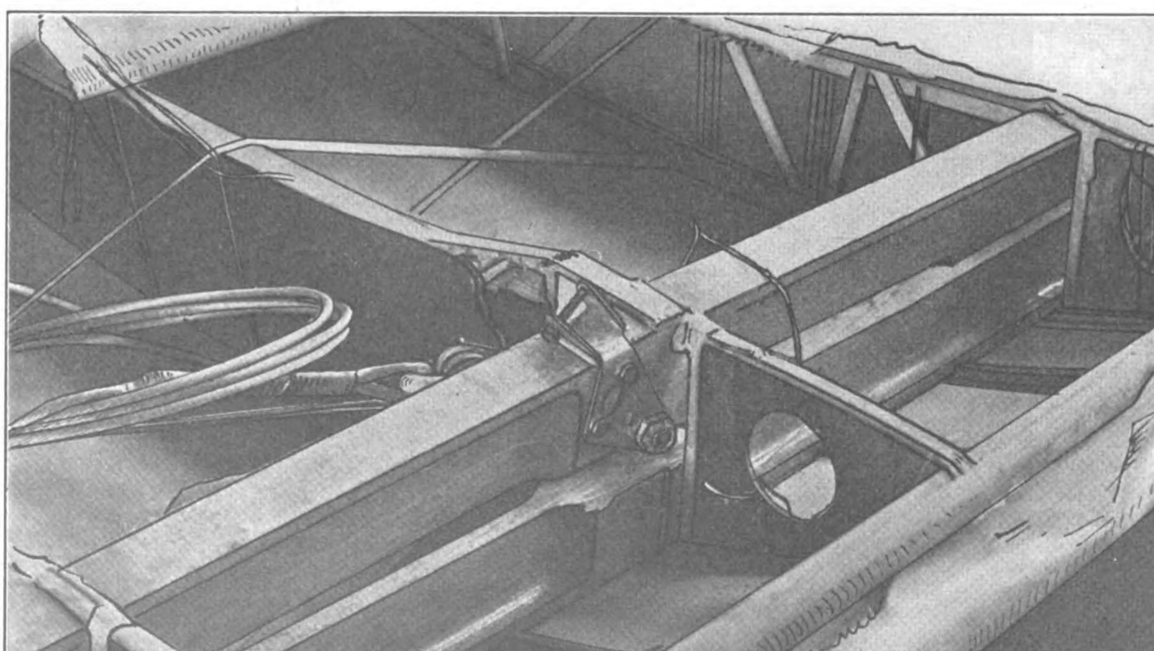


Fig. 30.

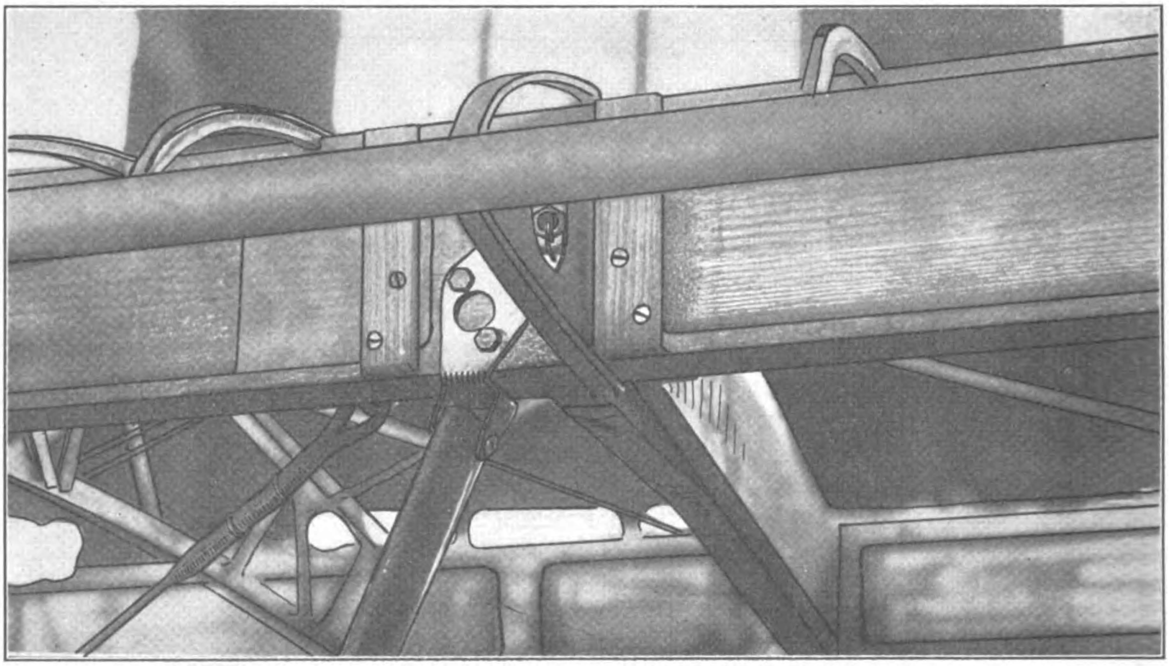


FIG. 31.

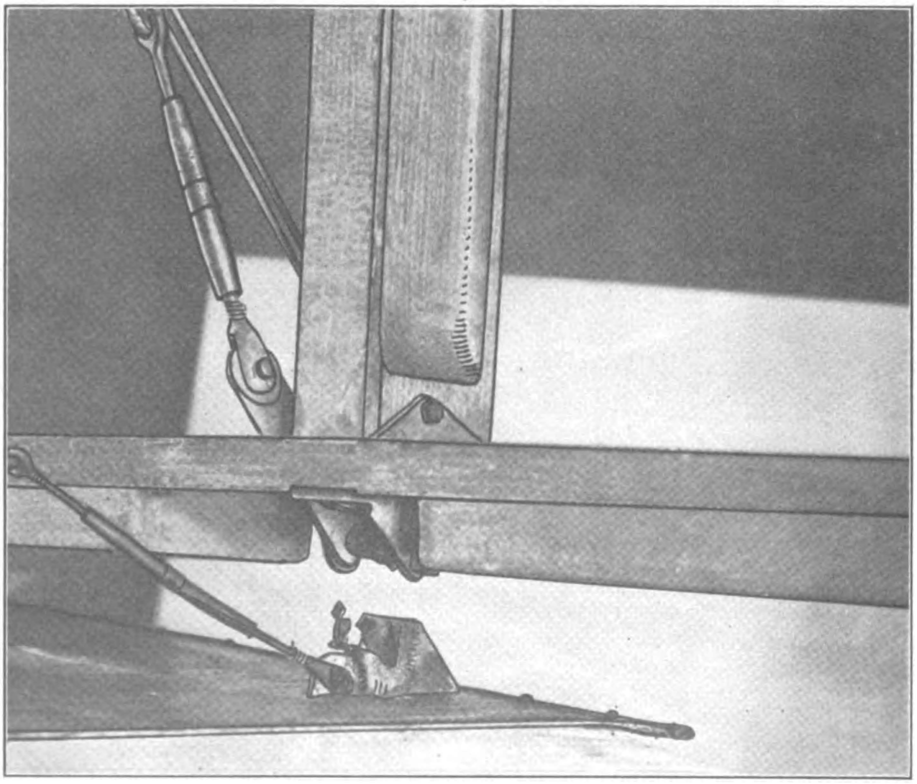


FIG. 32.

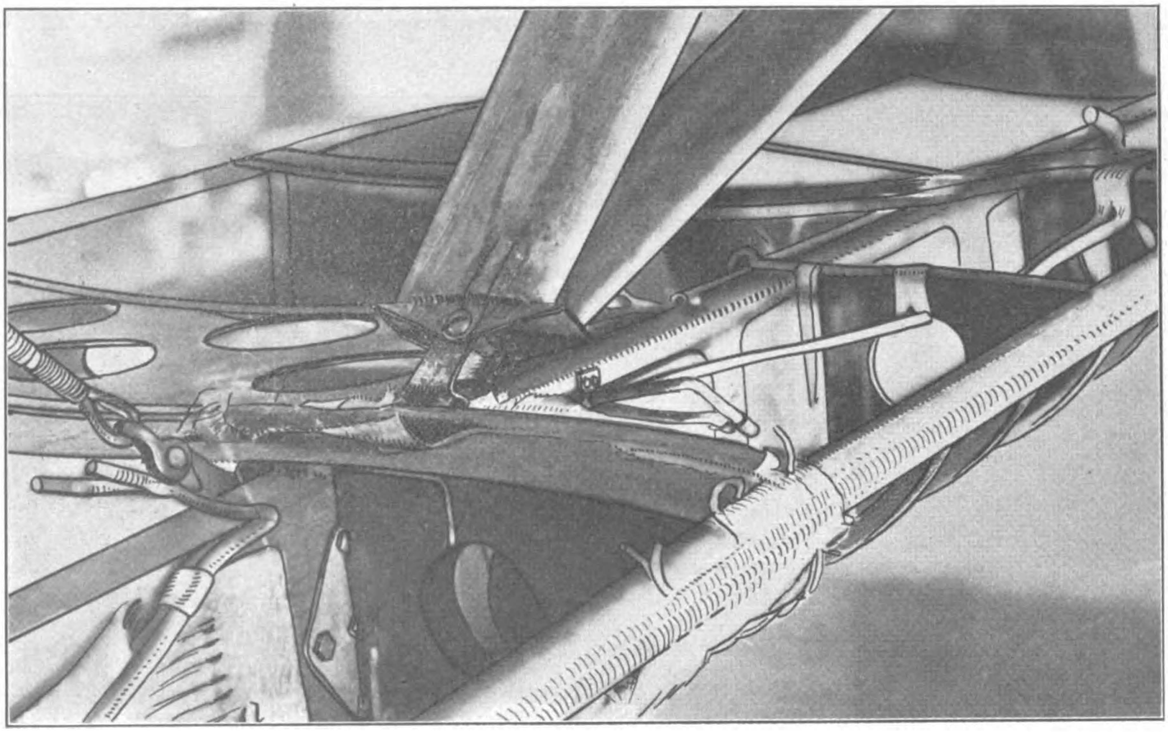


FIG. 33.

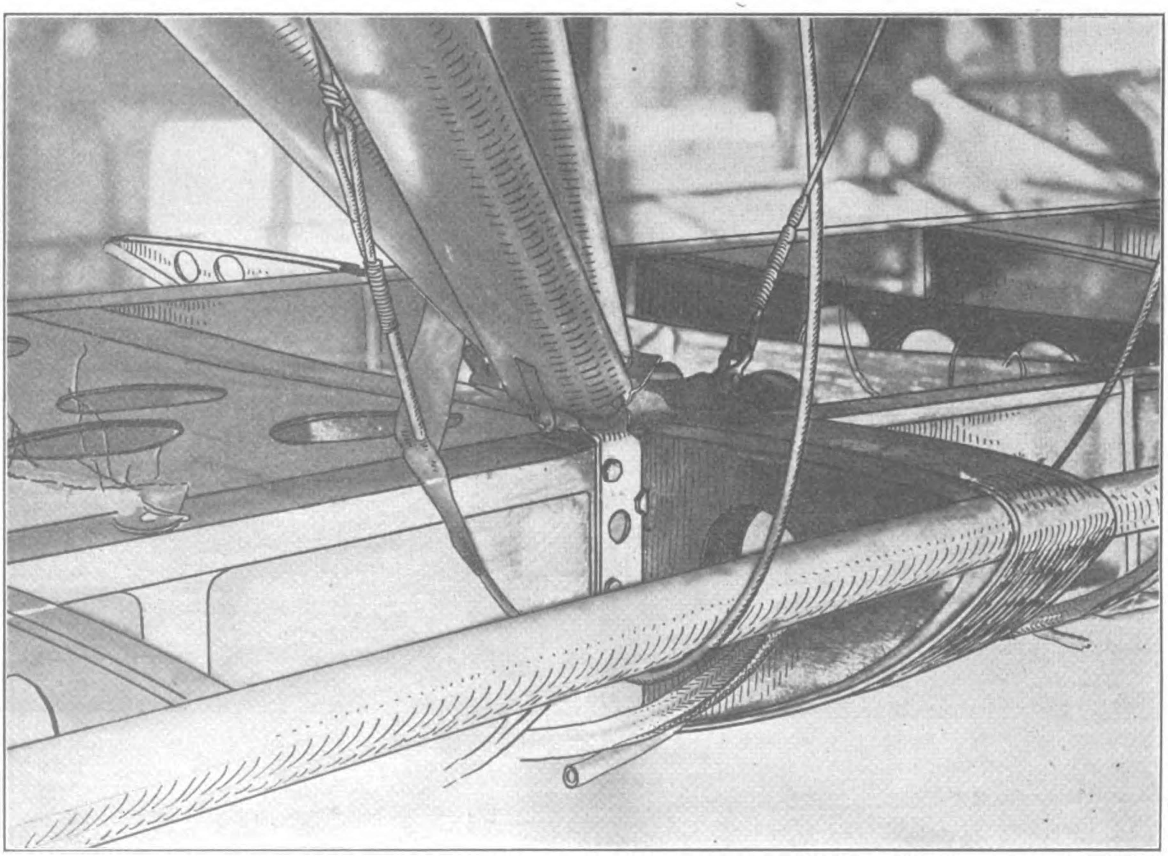


FIG. 34.

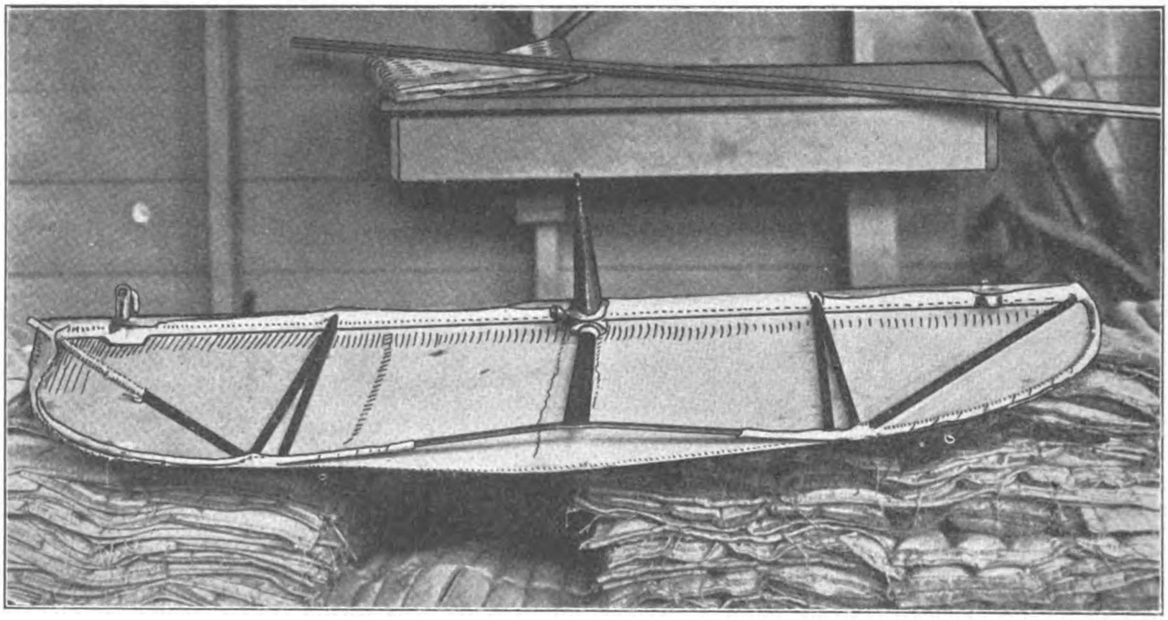


Fig. 35.

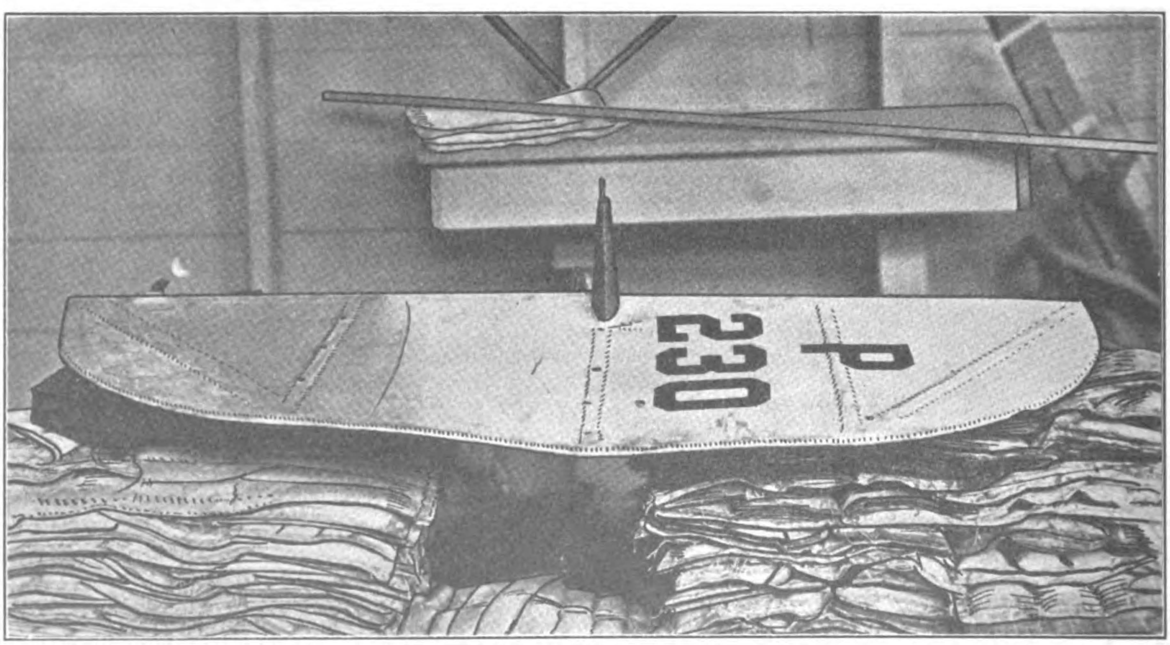


Fig. 36.

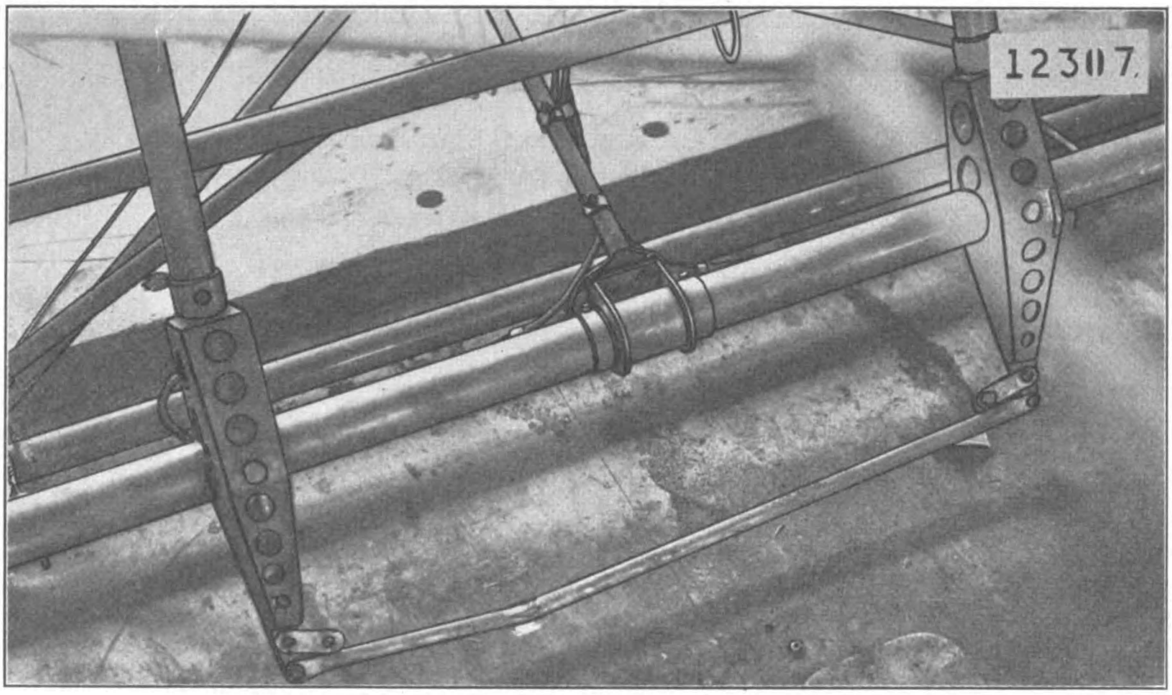


FIG. 37.

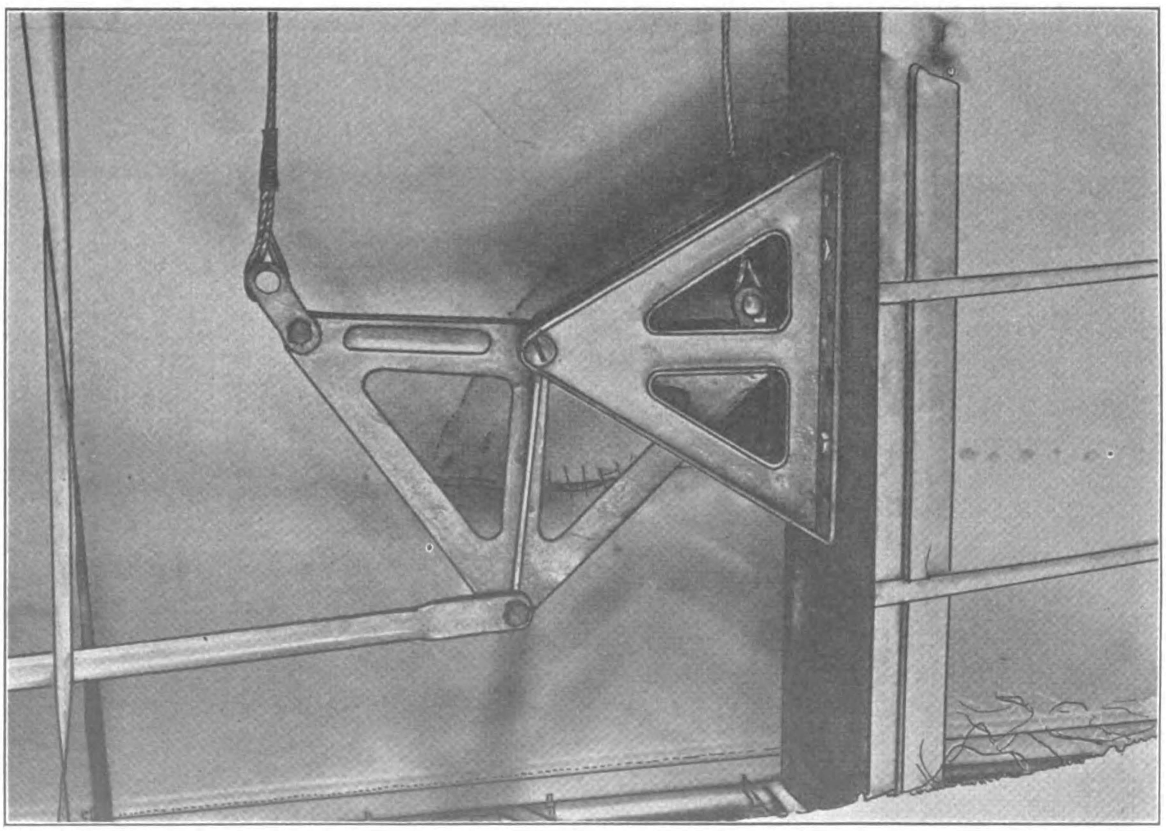


FIG. 38.

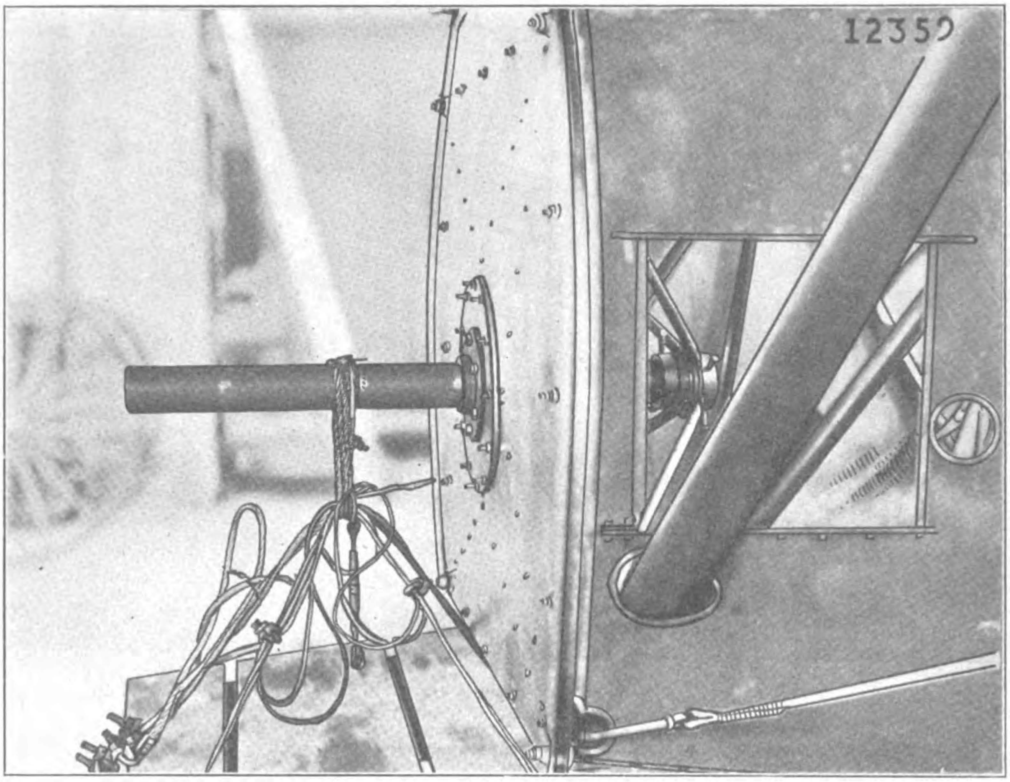


FIG. 39.

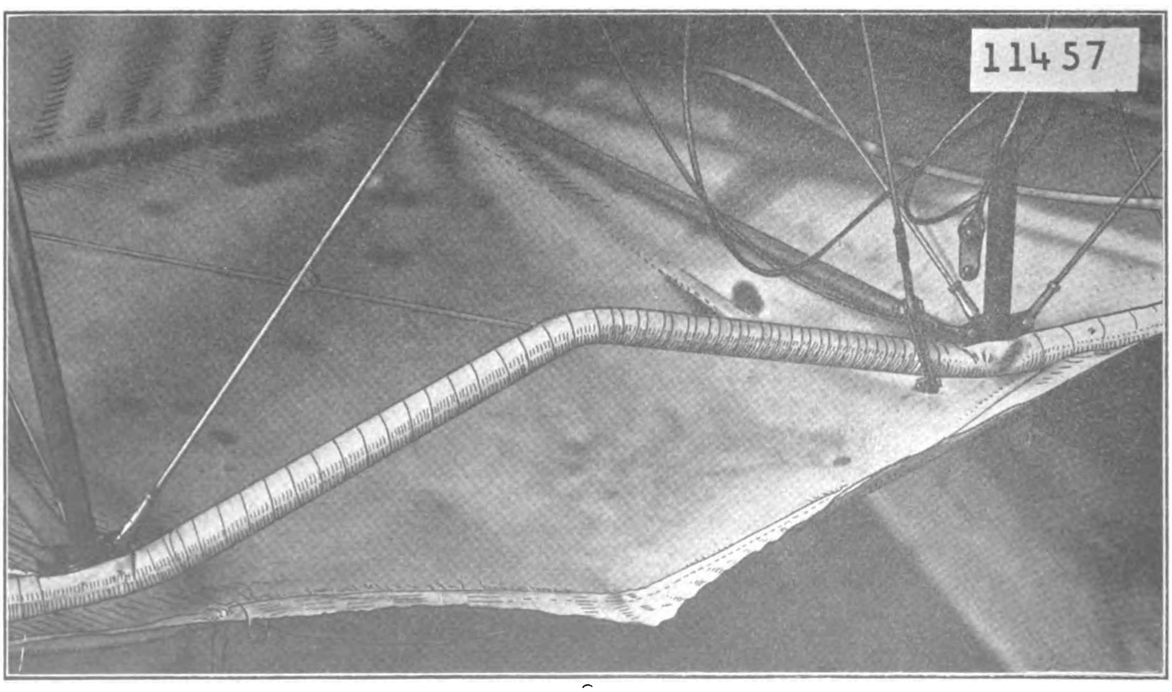


FIG. 40

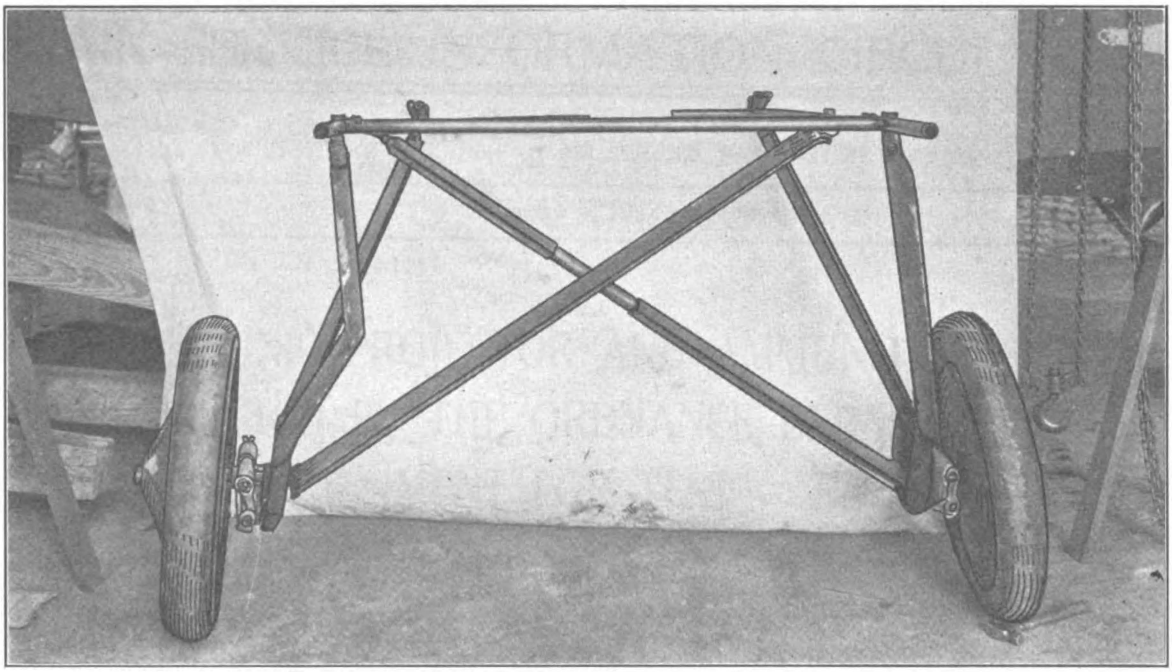


Fig. 41.

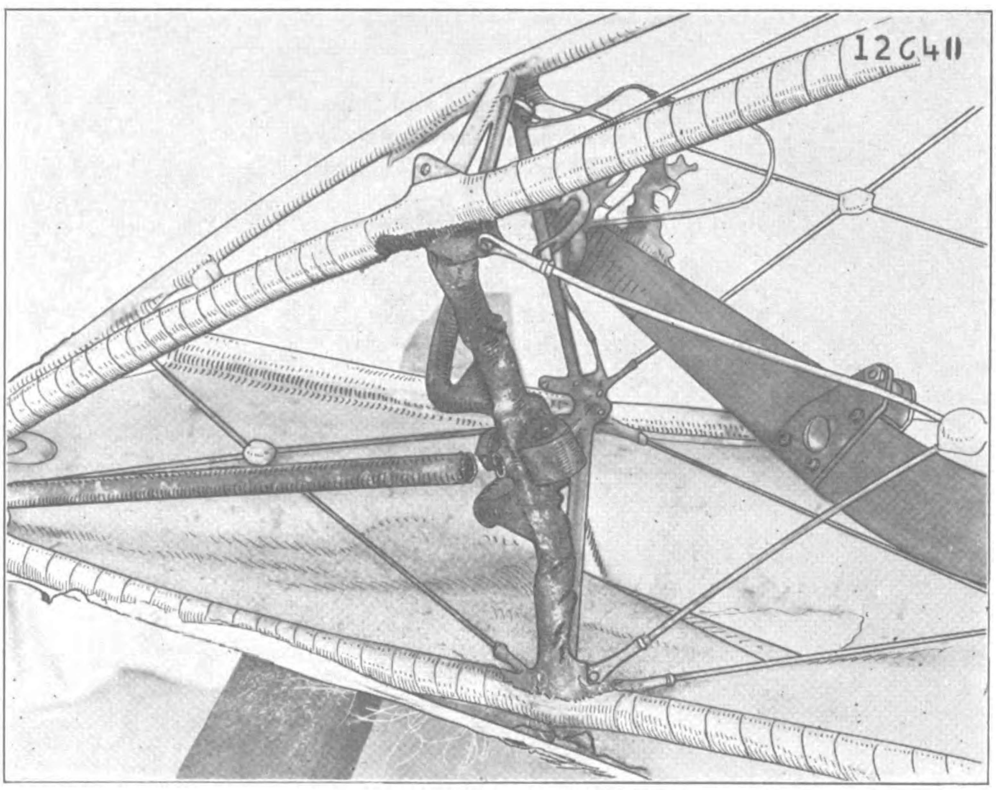


Fig. 42.